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Explosives in Agriculture.

GEORGE MARKS, Inspector of Agriculture, North Coast District.

IN such industries as mining, quarrying, well-sinking, excavating, tunnelling, &c., the use of explosives is an indispensable factor for successful and economical work. Apart from their application to defence purposes, explosives have long been in use in the commercial world, and the investigations and experiments of the chemist have resulted in the manufacture of many classes of substances, which have been specially compounded for specific and distinct classes of work. In all these there has been the aim to combine efficiency with economy, and there is not the slightest doubt but that their use has been the means of dispensing with a great deal of labour, and has also enabled many classes of work to be performed which would otherwise be impossible.

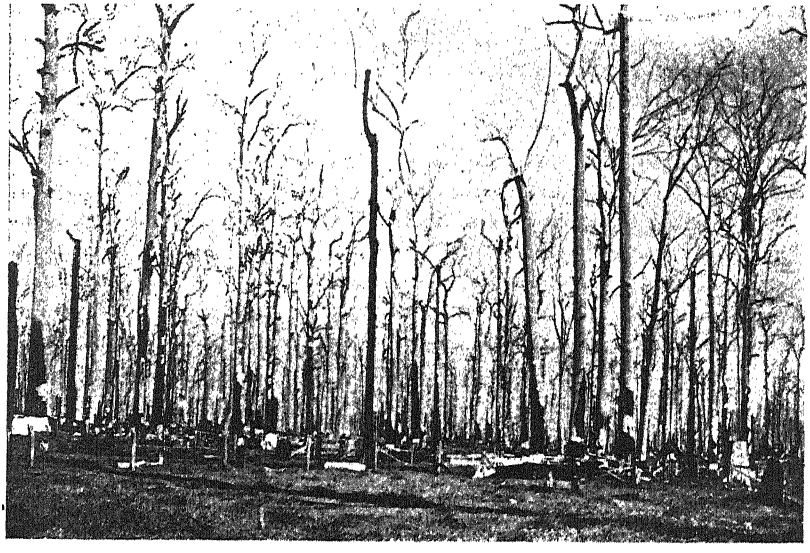
The use of explosives in agriculture is, however, of more recent origin. During the past few years, numerous experiments have been carried out in various parts of the world, to test the efficiency of explosives as an aid to land-clearing, sub-soiling, bursting of logs, &c., and as a result of these, it has been found that their intelligent use will not only enable such work to be performed effectively and expeditiously, but at a considerable saving in expense. By their use, huge stumps, that would necessitate many days' hard labour under a sweltering sun, can be shattered to pieces in a very short time, and at the expense of a few shillings; land with an unyielding subsoil, that would entail considerable expenditure to loosen and make it fit for an orchard to be planted, can in an equally short time be subsoiled effectively by the aid of explosives; and the winding-grained butt log of a hardwood tree that would baffle the wedges and mall of the timber-splitter is readily burst open by the tremendous force exerted by the explosive.

From a careful study of the subject, and from observations made and experiments carried out, it is very evident that explosives will play a very important part in the agricultural world in the future, though probably, on account of the dangerous nature of these materials, and the consequent careful handling and usage necessary, their use will not become general with any or all classes of the community. In other parts of the world a considerable amount of work is done with explosives, but in this State their use has only just passed the experiment stage.

Where Explosives are Useful.

In localities where timber is light, or where it is of such a nature that it readily decays, as is the case with our softwood scrubs, or when it may be got rid of without much trouble by the usual methods, the necessity does not

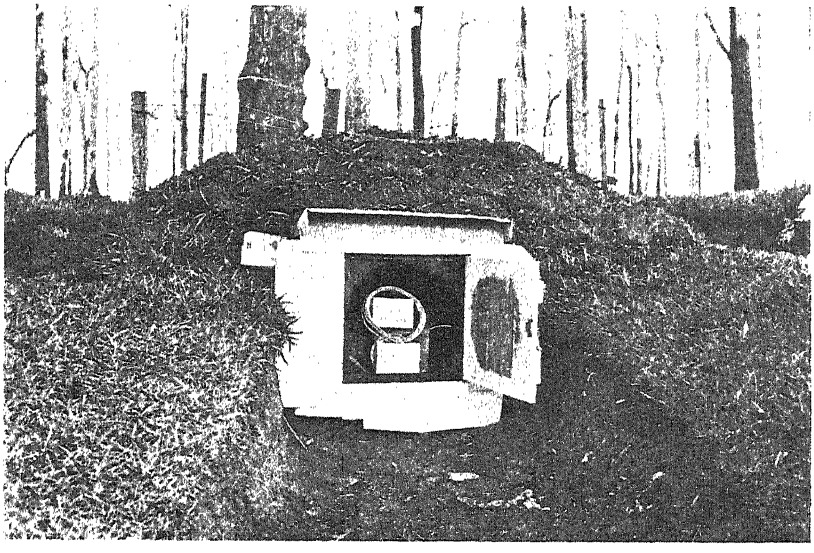
arise to consider other than ordinary measures; but in the thickly timbered districts of the North Coast and other parts, where gigantic hardwoods predominate, and where the labour and expense of removing these are beyond the means of the average pioneer or even ordinary farmer, the results that have been obtained by the use of explosives have a real and practical interest. There are also many farm lands which have been in constant cultivation for forty or fifty years or more, that have numbers of stumps which always form an eyesore in the landscape, and which have probably cost a great deal by straining ploughs or breaking machinery, or caused personal injury to the farmers themselves. There are numerous reasons why these remain, but as matters now stand, there is a probability that in the year 1999 many of these will



An army of spars. Showing the thickness of the timber in the Bonville district; principally flooded gum, tallow-wood, and box.

have disappeared, at least to the ground level, through the surface charring occasioned each season by the firing of accumulations of weeds or other rubbish at their butts. In any case, their presence is always a menace to good or clean farming, as they harbour all sorts of weeds that seed freely and replenish the supply annually. The numerous duties attached to the ordinary farm, which may be handicapped through insufficiency of farm labour, are no doubt largely responsible for many stumps remaining; while in the case of tenants, it very frequently happens that any permanent improvements effected along these lines are not allowed or paid for, and such labour is invariably recompensed by raising the rent at the expiration of the lease through the enhanced value of the land. But with the use of explosives these would be very cheaply and expeditiously removed.

In the newer districts, where settlement has recently taken place, the farmer is faced with the problem of how to clean up his holding of such hardwoods as ironbark, tallow-wood, box, gums of many species, and others. Even where advantage is taken of sawmills that may be located within a convenient distance in disposing of logs of commercial value, the stumps remain, which are a menace to effective cultivation. The cost of removing these is enormous, and instances have come under the writer's notice of land costing up to £50 to clear per acre, which, if placed upon the market after it was cleaned up, would not bring more than £20 per acre. Of course, it can be readily understood that it is not prudent to go to that trouble or expense on land of that description, but the manner in which small areas



Magazine on Mr. H. B. Faviell's farm, Bonville, Autumn, 1912.

suitable for cultivation are being cleared, speaks well for the indomitable energy and untiring perseverance of the settler, who, were it not for his optimism, would certainly be discouraged and miserably fail.

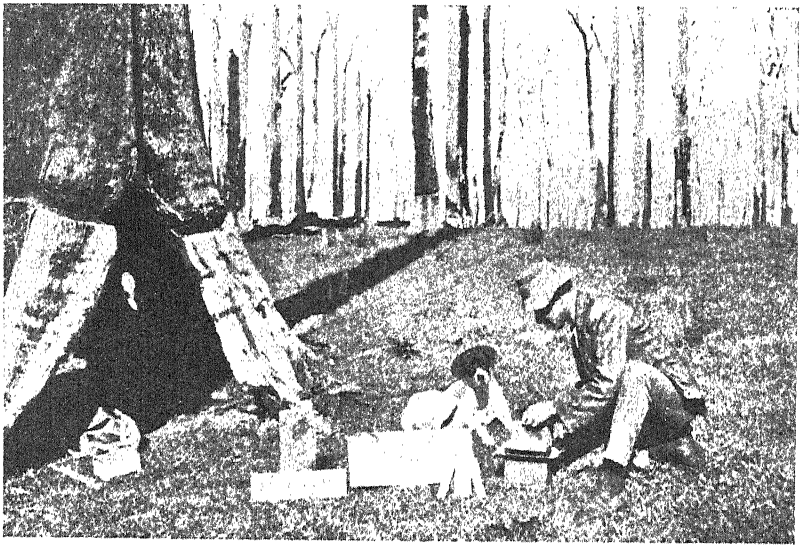
Of course, it would be impossible to state with any degree of certainty what saving would be effected by using explosives, as so much depends upon the skill and judgment of the user and the class of soil and timber, but in the hands of a careful and competent individual it is evident that from 25 to 50 per cent. saving could be effected over the methods usually employed. In individual cases this percentage could be set down at a higher figure.

It would, however, take some little time before an inexperienced person would acquire sufficient skill and judgment to know just how much explosive to use, and where to place it so as to get the maximum results in each case.

There can be no hard-and-fast rule laid down, as no two stumps of equal girth are identical in the manner in which their roots are distributed in the soil. To be successful it is essential that some considerable practical knowledge be acquired of the habits of growth and general nature of hardwoods. Absence of this must necessarily involve unnecessary labour and waste of explosives.

Kinds of Explosives.

As there are so many explosives on the market specially designed for land-clearing, it would be impossible to say really which is the best. All have their merits more or less, so that the user should decide upon one particular kind and carefully study it.



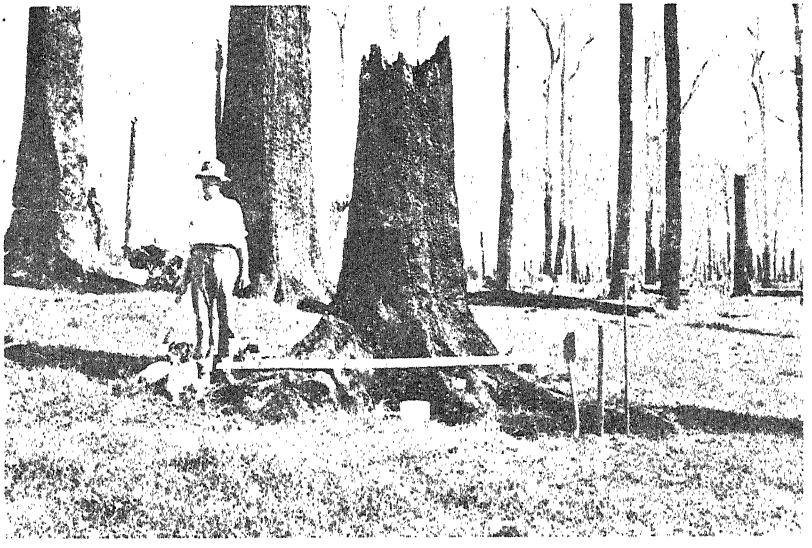
Dipping the rack-a-rock plugs in Myrbone oil. Mr. H. B. Faviell's farm, Bonville, Autumn, 1912.

Farmers and selectors are strongly advised not to experiment with explosives. They are not to be played with, as they are dangerous. The proper place for such work is with the manufacturer, who is thoroughly conversant with their chemical nature and mechanical condition, and whose general knowledge of the chemistry of explosive mixtures generally ensures the necessary precautions being taken that enable him to accurately determine the force exerted by an explosion without risk to life or limb.

The writer's experience has been confined principally to gelignite, and the methods described must be considered in connection with this explosive. There would naturally be some slight modifications when other explosives are used, though, in the main, the general mode of procedure would be the same in all cases.

Method of Firing.

There are two principal methods of firing charges—first, by the use of safety fuse; second, by the use of electricity. The former method may be adopted where it is only necessary to use a single charge. But usually in dealing with stumps or trees of any size it is found that more effective work can be performed by dividing the amount of explosive required into several charges, and placing them in suitable positions than by using them as one charge. It is essential, however, that all the charges be fired at the same instant, and this cannot be done when the ordinary safety fuse is employed. Where electric detonators are used, and a magneto exploder is at hand, the charges can be connected up by wires, attached to a length of insulated cable, and all fired simultaneously by electricity.



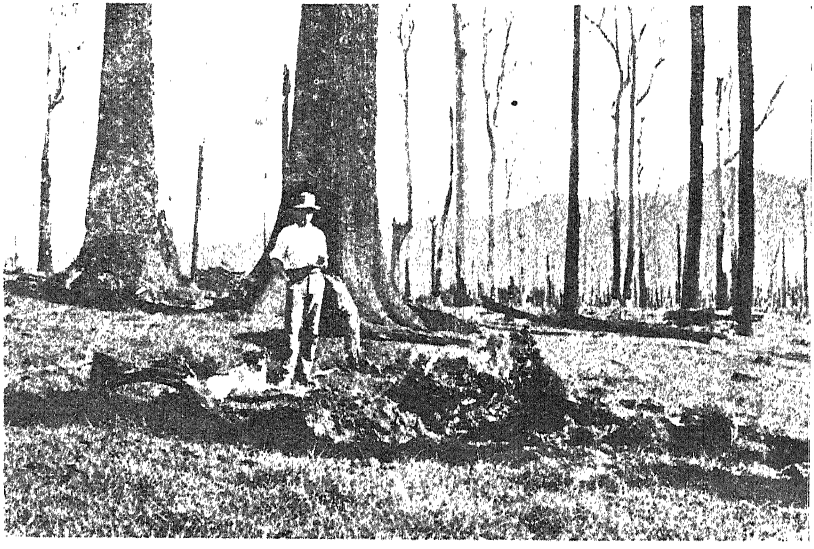
Sound brush box stump on Mr. H. B. Faviell's farm, Bonville, ready for firing.

For this reason the latter system is to be recommended. By its use there will be no hanging fire; for if the wires are improperly connected or not connected at all, the electric current cannot reach the charges and no ignition can take place. On the other hand, it occasionally happens that a safety fuse, from some cause, may hang fire, and many accidents have occurred through people having returned, after the usual length of time has elapsed for the charge to explode, to meet the full force of the explosion. This hanging fire invariably happens when the fuse has become damaged or damped; but where every precaution is strictly observed in storage, handling, protection from weather, and proper connection with the detonator and charge, there should be no miss-fires. However, for the sake of those not familiar with the system, both methods will be briefly described.

All explosives require a sharp initial explosion in order to develop their force, and this is given by the use of detonators. The detonator for safety fuse is a small solid-drawn copper tube, closed at one end and partly filled with an explosive compound capable of developing intense local force and heat. This compound consists of fulminate of mercury and chlorate of potash in such proportions and compressed into the bottom of the tube by special machinery in such a manner that it will yield the most effective results.

Safety Fuse.

Safety fuse, which might be likened to stout cord, varies in diameter from $\frac{1}{5}$ to $\frac{1}{4}$ of an inch. It has a small core, consisting of a column of fine-grained



View taken from the same spot immediately after the explosion. Gelignite to the value of 4s. 6d. was used, and the stump was blown clean out and fell in several pieces some 60 or 70 feet away. It is estimated that £1 or 25s. would have been required to take it out by hand.

gunpowder, which on ignition burns evenly at a slow rate, conveying fire to the charge or detonator; and this is the primary function and essential requirement of all safety fuse of whatever construction or under whatever conditions it may be used. The formation of this continuous core on such a fine scale, so that no gaps occur to interfere with the efficiency of the fuse, and the regulation of the quantity so as to avoid any variation in its burning speed, calls for much skill on the part of the manufacturer, and no little speculation on the part of those unacquainted with the process. The term "safety fuse" means a fuse for blasting which burns but does not explode; which does not contain its own means of ignition, and which is of such strength and construction, and contains an explosive in such quantity, that the burning of such fuse will not communicate laterally with other fuses.



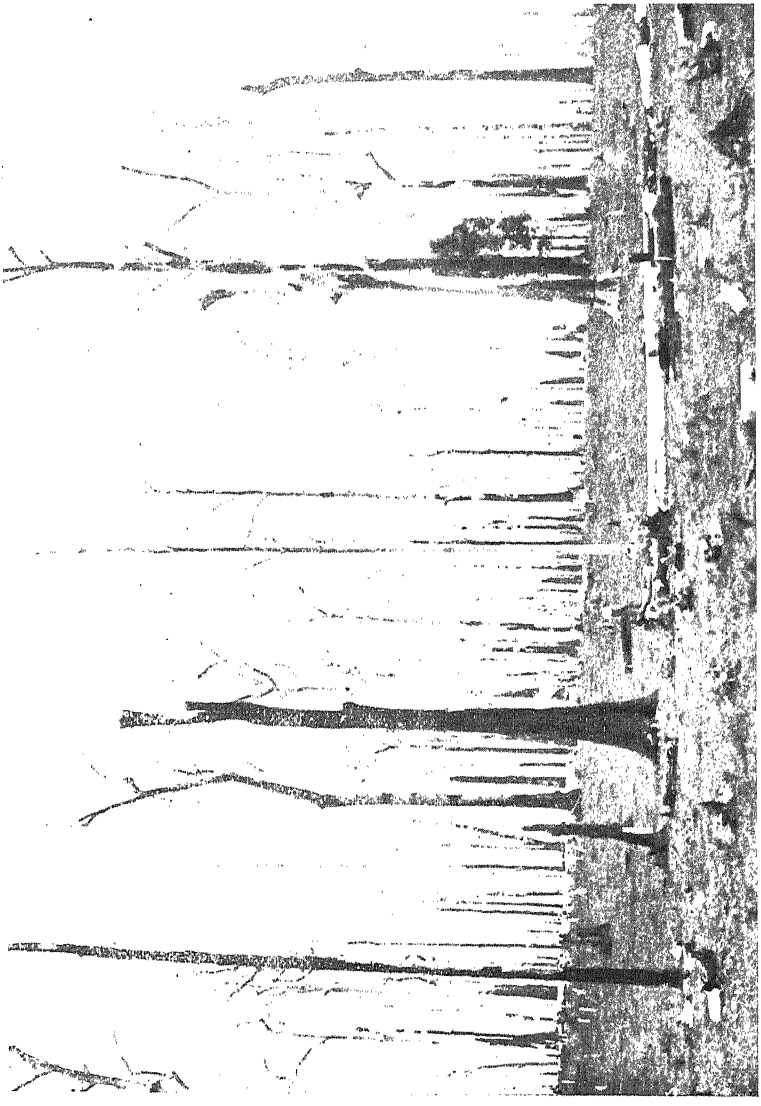
Sound brush box tree ready for firing the charges. Mr. H. B. Faviell's farm, Bonville. Autumn, 1912.



The battery used for firing the charges. Mr. H. B. Faviell's farm, Bonville, Autumn, 1912.



The explosion. This sound brush box tree was lifted bodily 2 feet out of the ground. The photo shows how all the small limbs are broken. Mr. H. B. Faviell's farm, Bonville, Autumn, 1912.



The large round brush box tree levelled to the ground by the charge.

EXPLOSIVES IN AGRICULTURE.

A good fuse should be reliable and give regularity of burning. It is preferable to use a sufficiently waterproofed fuse, so that there is certainty of action in damp as well as dry ground. It should have a good powder core, burn quietly but steadily, and the final "spit" should be strong enough to ignite another piece of fuse at least 1 inch away.

The burning speed varies with different makes, but may be set down at about 90 seconds per yard. A knowledge of this is necessary so as to determine what length to use to enable sufficient time to retire to a place of safety. The fuse should be sufficiently pliable so as not to be injured while being bent, uncoiled or handled. The diameter should be regular and fit the detonator well.

In attaching it to the detonator, the fuse should be cut, not straight across, but obliquely or slantwise, with a clean sharp tool. This exposes a larger suface of the powder core, the powder eye thus formed is more readily lighted, and a better spit is obtained. A blunt instrument frays the yarns, the powder becomes dislodged, it is more difficult to insert it in the detonator. and its effectiveness is thus impaired. A few inches should always be cut off the coil before use, especially in humid atmospheres.

After the required length is cut off, one end is gently inserted in the detonator, and the end of the detonator casing is gently clamped by means of a pair of nippers specially provided for the purpose. Many miners adopt the method of fixing the fuse by closing the ends of the casing with their teeth. This practice should never be resorted to, as a little thoughtlessness or forgetfulness on the part of the individual would result in part of his head being blown away. The fuse with detonator attached is now ready to insert in the charge, which will be referred to later. The charge is exploded by applying a lighted match to the end of the fuse, and immediately retiring to a place of safety.

Firing by Electricity.

For those who intend to do much work with explosives, it is far preferable to procure an electric outfit. In addition to the advantages already mentioned, electricity really renders this class of work as safe as it is possible to do so, and with proper care and attention an outfit will last for almost an indefinite period. For its use the following outfit is required :—

Electric detonator fuses.
A magneto exploder.
Insulated cable.
Insulated connecting wire.

It must be distinctly understood that the detonators used in conjunction with safety fuses cannot be used with the electric outfit, nor can electric detonators be used with powder fuses.

Electric detonator fuses are made in two systems, viz., high tension and low tension. High tension may be concisely described as chemical fuses. Attached to the ends of the wires embedded in the detonator is a sensitive chemical composition, which is ignited by a spark passing between the

terminals and causing the explosion. Low-tension electric detonator fuses have within the detonator a bridge of very fine wire encased in a suitable flashing mixture. This wire, on becoming heated by the current generated by the exploder, ignites the mixture, which in turn explodes the detonator.

The low-tension electric detonator fuses are to be preferred for our conditions. They are better for firing "in series," because it is easier to obtain a more exactly uniform electrical resistance in fuses of this type. They remain in good condition for an indefinite period, provided they are stored in a dry place, and their efficiency can be verified at any time by testing with a galvanometer, designed specially for this purpose.

The leads of electric detonator fuses consist of two wires, each of which is wrapped with two layers of cotton, and thoroughly saturated with insulating compound. They can be procured in various lengths. The insulated connecting wire is used to connect the ends of these, should they be situated some distance apart.

There are many types of exploders in use; that used by the writer is a magneto exploder capable of firing five shots at once. This, for all practical purposes, is sufficient. Any increase in the number of charges may result in some errors being made in the coupling of the wires. Care should also be taken that no attempt be made to fire more charges than are stated by the makers of each machine. If, however, it is necessary to fire a large number of shots simultaneously, a rack-bar exploder should be used.

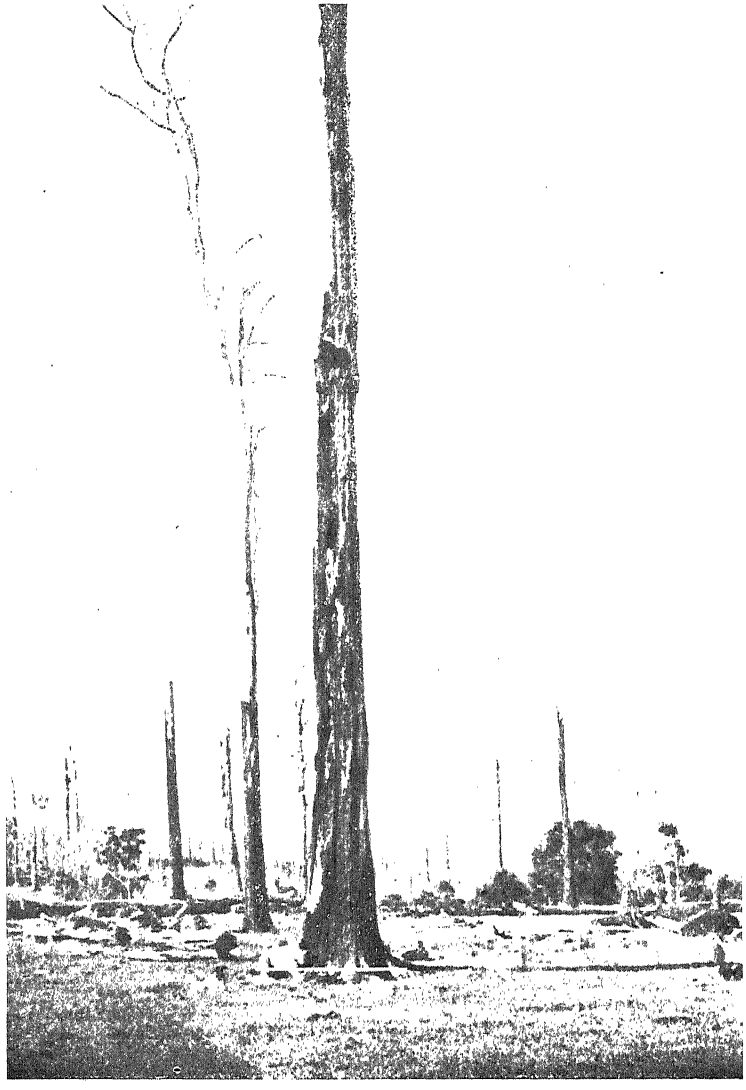
The insulated cable consists of two wires, each covered thoroughly with cotton and insulating compound, and encased in an outer covering, which gives it the appearance of a single cable. It should be at least 100 yards long, and is used to connect the wires of the detonators to the exploder, whereby the electric current is conveyed when firing.

In the purchase of a cable a considerable saving can be effected by obtaining the best quality insulated telephone wire, such as is used for connections in the interior of buildings. This will cost 5s. per coil of 110 yards, or 10s. for the two. It is advisable to select two colours, red and white. These can be wound or unwound on the reel together. They serve the purpose quite as well as the more expensive cables, and with ordinary care will last a long time.

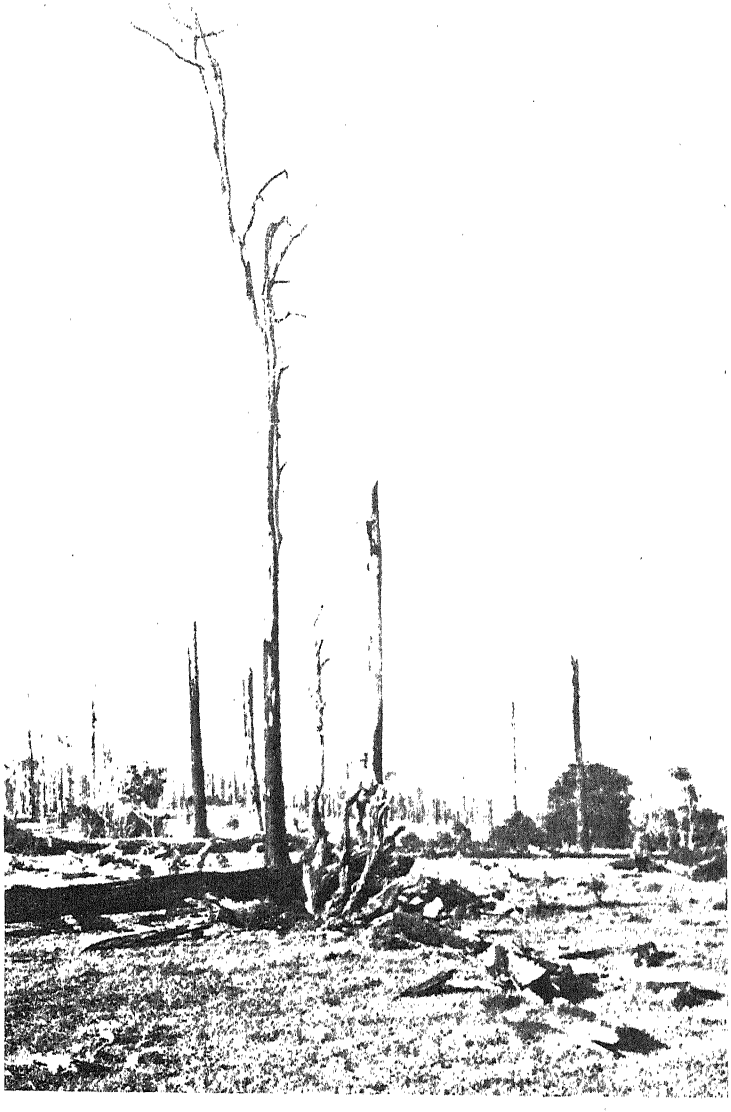
For testing the cables, a galvanometer may be added to the electric outfit. With continued use, the insulating material on the cables is sure to wear off. When, through careless handling, kinks, or the falling of timber on them after explosions, the cable is in any way broken, it breaks the circuit, thus preventing the current from being conveyed to the charges. If the cable is intact there will be deflection of the needle of the galvanometer after the wires are coupled to the exploder. Should there be no deflection, it indicates that the circuit is broken somewhere.

Removing Stumps.

The amount of explosive required to remove stumps varies considerably, and no definite amounts can be given or hard-and-fast rules laid down as to



A large, sound brush box tree being charged for firing. Mr. H. B. Faviell's farm, Bonville, Autumn, 1912.



After the explosion. The brush box tree shattered to pieces.

the location of the charge or charges. There are very great differences in the classes of hardwoods—size, toughness, manner in which the roots are distributed, size of tap root, nature and condition of subsoil, &c.—all of which are factors that have to be considered before commencing operations.

No matter how well informed the individual may be on the work generally, it will necessitate some considerable amount of experience before proficiency will be obtained. There are really no two stumps of equal girth that are similar as to the arrangement of their root systems, and every one requires to be studied individually. Those, however, who are accustomed to land clearing, particularly that of grubbing out stumps, will be in a good position to "size" up the nature of the stump, and their practical experience will enable them to judge to a nicety the arrangement and distribution of the roots.

This is a very important matter; for the successful use of the explosive depends very largely upon the ability to judge of the "hold" the stump has by its roots, so as to determine the amount of material to use and where to place the charges so as to get the greatest amount of effective work done. In this connection it would be preferable to watch the mode of procedure of some experienced individual before starting "on one's own," and with some practice any careful and intelligent person should soon become proficient.

At the outset it should be stated that it is advisable to deal with sound stumps, or those that have small pipes only. The effect upon hollow stumps would be that a great deal of the force of the explosion would be spent much in the same way as a charge in a gun—the amount wasted in this direction being governed by the size of the pipe and the proximity of the charges to this pipe. Then again, it frequently happens that a pipe opens out considerably at the ground level, whilst others run out altogether, and this is where practical judgment counts for so much.

The best work is obtained with sound stumps in firm ground, the poorest results with hollow stumps in soft or loose soil. It thus happens that the hardest stumps to take out by the ordinary hand methods are the easiest to remove by the explosive. They may be removed by either of two methods—

(*a*) Placing the charges under the stump, or
(*b*) Placing the charges in holes bored in the stump or large spur roots.

In many instances a combination of both methods is recommended. Since the object aimed at is to remove the stump altogether, it is found that the best results are obtained by having the charges placed underneath, provided of course that they can be placed where required, that the stump is sound, and that the soil is in the proper condition. Under these circumstances the effect of the explosive is to lift the stump on the one side and force the earth down on the other, but as the former yields more readily the result is that the stump is generally lifted bodily out, and in doing so it is invariably shattered to pieces, while the earth surrounding it is blown away at the same instant.

If the whole of the charges are inserted in holes bored in the wood, the result of the explosion is to force a portion of it upwards while that below is pressed downwards. It certainly shatters the whole of the stump in the neighbourhood of the charge, but usually a considerable portion below the charge is left in the ground. Where there are objectionable tap-roots and the ground is very hard, it is advisable to insert one or more of the charges by boring obliquely from the ground level down towards the centre of this root. The shattering that is done will enable those portions left in the ground to be burnt out readily.

Appliances.

With small stumps one or two charges will be found ample, but with those of larger diameter it is preferable to use from three to five. The amount required for a charge depends upon the amount of resistance to be offered, and this must be decided by the operator.

In the dividing up of charges, more particularly when dealing with large timber, it is advisable not to have a large number of small charges. For example, suppose it is intended to use 10 lb. of gelignite on a very large stump or tree, it would be found that five 2-lb. charges (provided, of course, they were properly placed), would give better results than ten 1-lb. charges.

The following appliances are found necessary :—

1 light steel bar ;
1 earth auger, $1\frac{1}{4}$ or $1\frac{1}{2}$ inch diameter ;
1 bridge-builder's auger, $1\frac{1}{4}$ inch diameter ;
1 scoop ;
1 stemmer (wood) ; and
1 metal scraper.

The bar should be 4 feet long, made of $\frac{7}{8}$ inch octagon drill steel, pointed at one end and drawn out to $2\frac{1}{2}$ inches at the other, with the flattened cutting edge bent a little beyond the line of the bar so as to provide leverage.

A good earth auger can be made by filing out the worm of a Mathieson auger, and afterwards filing the cutting edges towards the centre, so that this latter is about $\frac{3}{16}$ inch from a line drawn across from each side of the cutters. This arrangement will enable it, with a little pressure at the start, to "bite" in any soil. The bridge-builder's auger will answer best for wood-boring. It never chokes, and will bore freely at any angle in any grained timber. It will be necessary to chisel the wood to start, to enable the cutter to bite. Both augers will need to have their handles lengthened by welding an extra length of rod on, so that they are about 4 feet overall. The wooden handle can be used, or a "tee" handle welded on.

The scoop is made out of a piece of stout gauge galvanized iron, cut and bent to resemble an ordinary seed or flour scoop, and attached to a wooden handle (an old axe-handle is just the thing). Its edges can be bent to any degree desired, which is an advantage where a hole has to be made between two closely situated roots. Its use is to remove the earth loosened by the bar.

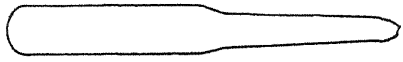
The stemmer is a wooden rod, rounded and reduced in size to fit the auger holes. It is used to tamp in the loose soil around the charges.

The metal scraper is not always required. It consists of a rod with a flattened end, bent at right angles, and is used to draw out earth or other material from an auger hole which may not be removed otherwise. It is found, however, that the bulk of the material can be removed by pulling the augers out without turning, provided that too much is not taken at once. The metal scraper is essential where drilling in rocks or quarries is done.

The earth hole is made either by the earth auger or the bar, and the earth removed without disturbing the sides, so that one's arm can be inserted. Some judgment and experience will be required in order to tell where the hole can be made, so as to get under the stump. This can usually be done at or near the angle caused by the junction of two large roots. An effort should be made to get the charge fairly deep down, and well under either the centre of the stump, if one charge is used, or under large hip roots at the junction with the stump, if a number of charges are required. Where it is impossible to get under the stump, holes should be bored in the wood. If four charges are needed, each should be so located as to carry one-fourth the burden, so to speak, of the stump, and so on. If the stump be hollow, care should be taken that the charges are located under the sound portions, so that they have good confinement. If the stump be located on a slope, the holes should be made from the up-hill side.

Charging.

The cartridge or cartridges should be of such size as to pass in easily. If the charges have to be forced there is always danger, especially when the detonator is attached. Every charge should be easily inserted, and care exercised that there is no rough handling or concussion. To ensure complete detonation of the whole charge, the detonator should not be smaller than the size specified by the makers of the explosive, and it should be entirely buried in and brought into the closest possible contact with the explosive. For this purpose a wooden peg is used to make a hole in the end of a cartridge, so that the detonator can be inserted. The wires of the detonator are then gently bent over, and a half-hitch made near the other end of the cartridge. These prevent any possibility of the detonator being pulled out accidentally.



Wooden pin used to make hole in cartridge to insert detonator.

Can be made of any soft wood. May be 6 or 7 inches long and the thickness of the detonator body at one end.

In the holes bored in wood, the cartridges are inserted one at a time, and gently pressed home with the wooden tamping rod. The cartridge carrying the detonator is inserted last, and is only pushed down hard enough to be sure that it touches the others. For earth holes made under the stump, the charge of cartridges can be conveniently tied together with a piece of string,

having the primer cartridge pressed in the centre, and then placed in position. A quantity of fine loose earth or damp clay is then pressed gently on to the charge for several inches, and, afterwards the wooden tamping rod is used to compact that used to fill the opening.

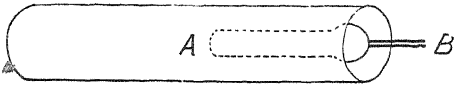


Diagram showing position of electric detonator inside gelignite cartridge.

A—Electric detonator. B—Wires attached to detonator.

After all the charges have been inserted, the next operation is to connect the wires. The ends of the detonator wires and cable are stripped of their insulating material for about 2 inches, and made clean and bright. They should then be carefully joined by twisting the bare ends of the wire. They are so connected that the whole series forms a circuit, the electric current passing from one of the cable wires through each detonator, and returning by the other wire of the cable. After all the detonators are connected, the loose wire of the first and the last detonators are joined to the two wires of the firing cable. The cable is unreeled from the stump previously. It should be 100 yards long. Care should be taken to see that none of the junctions of the wires come in contact with the earth. After all is ready and the tools removed to a safe distance, the cable is connected with the magneto exploder. The charges are then fired.

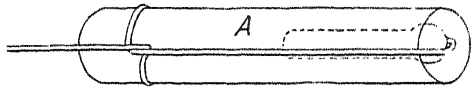


Diagram showing position of detonator in gelignite cartridge, and the wires given a half hitch round the cartridge. This prevents the detonator being pulled out should the wire be pulled accidentally.

With the proper amount of explosive suitably placed, the result of the explosion will be the shattering of the stump which, if not completely blown out, can be readily disposed of by burning.

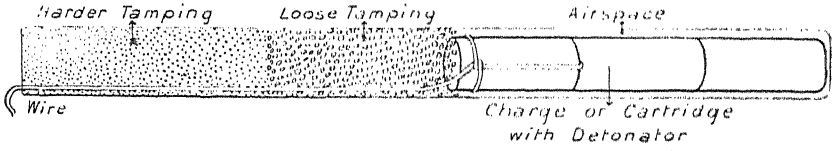


Diagram showing position of cartridge or charge, and how the bore-hole is filled up first by loose tamping near the charge and farther out by harder tamping.

Treatment of Trees.

The method adopted for trees is similar to that for stumps, excepting that if it is intended to bring them down a larger quantity of explosive will be needed. If, however, it is intended to clear the land, it is not advisable to bring the trees down. The best results are obtained by using a sufficient quantity of explosive to blow out the earth from underneath, and burst or splinter the barrel. This enables a good fire to be obtained, and the draught thus secured results in the worst part of the tree being burnt before it comes down. It must always be remembered that trees burn better standing than felled.

Bursting Logs.

It frequently happens that logs which have a somewhat curly or twisted grain have to be discarded for splitting purposes, and others of great size are somewhat difficult to burst open with the mall and wedges. Gelignite will be found of great service in these cases. Holes are bored in line along the length of the log and small charges inserted and fired. Care must be taken that too much explosive is not used; otherwise the log will shatter beyond usefulness.

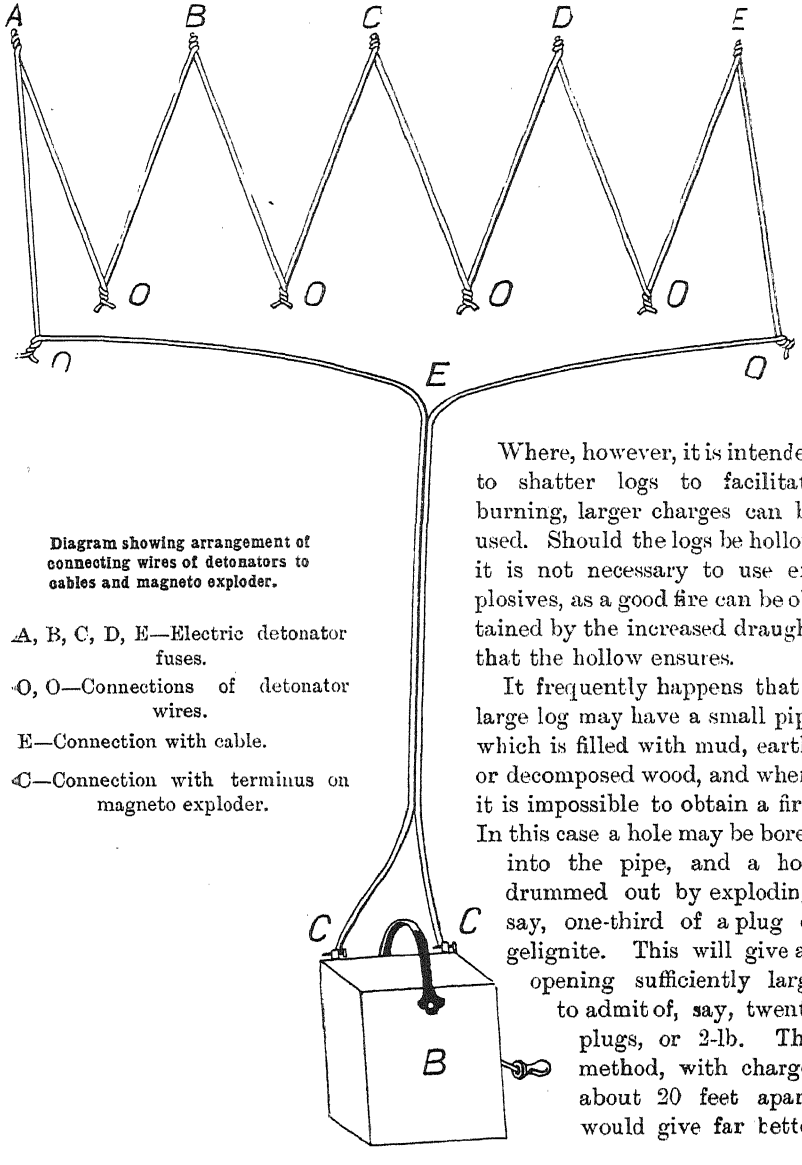


Diagram showing arrangement of connecting wires of detonators to cables and magneto exploder.

A, B, C, D, E—Electric detonator fuses.

O, O—Connections of detonator wires.

E—Connection with cable.

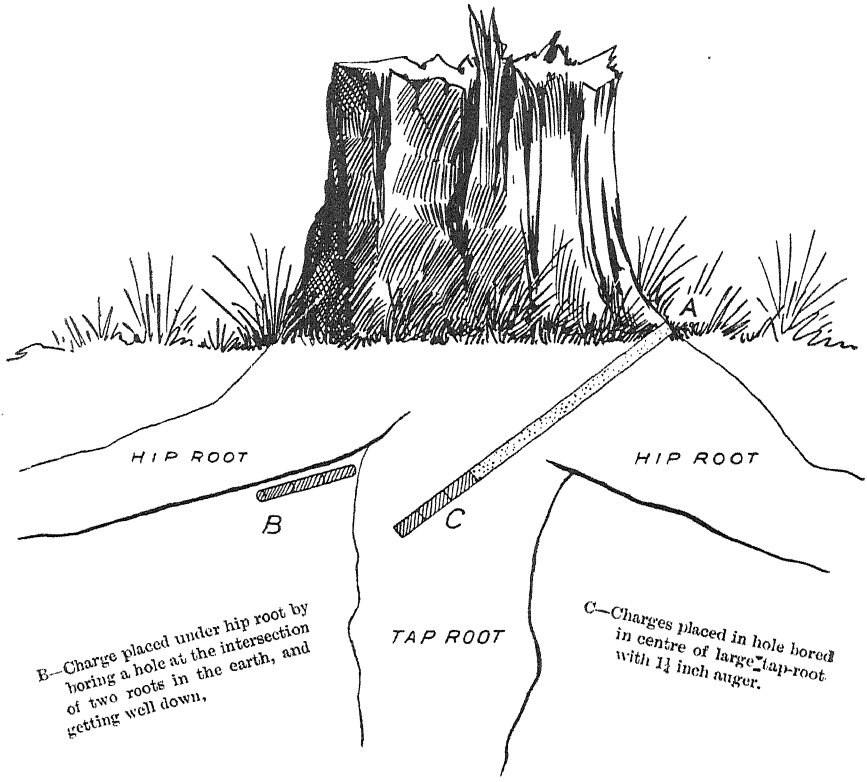
C—Connection with terminus on magneto exploder.

Where, however, it is intended to shatter logs to facilitate burning, larger charges can be used. Should the logs be hollow it is not necessary to use explosives, as a good fire can be obtained by the increased draught that the hollow ensures.

It frequently happens that a large log may have a small pipe which is filled with mud, earth, or decomposed wood, and where it is impossible to obtain a fire. In this case a hole may be bored into the pipe, and a hole drummed out by exploding, say, one-third of a plug of gelignite. This will give an opening sufficiently large to admit of, say, twenty plugs, or 2-lb. This method, with charges about 20 feet apart, would give far better

results than by smaller charges nearer the surface, which in all probability would result in a few splinters being blown out.

In all cases, experience is needed to determine the right amount to use to obtain the proper bursting effect.



Section of strong tap-rooted stump, showing how by means of a wood auger the charge is inserted deep down.

Subsoiling.

For lands intended for orchard work which require their subsoils well loosened, or for any other class of land which would be benefited by subsoiling, explosives will be found of great service, and are destined to play a very important part in the future. The object in each case is not to remove the surface soil, as happens when dealing with stumps or trees, but to loosen the subsoil, and the effect of the tremendous force exerted by explosives is a series of fissures being formed that spread out in all directions and enable the roots of trees or deep-rooting crops to penetrate with ease.

For subsoiling, holes are bored with the earth auger to a depth of 2 feet 6 inches to 3 feet deep, and a gelignite cartridge with detonator is placed in the bottom. These should be placed about 16 feet apart, or in the case of



Inserting the charge under a large round tallow-wood stump. Mr. H. B. Faviell's farm, Bonville, Autumn, 1912.

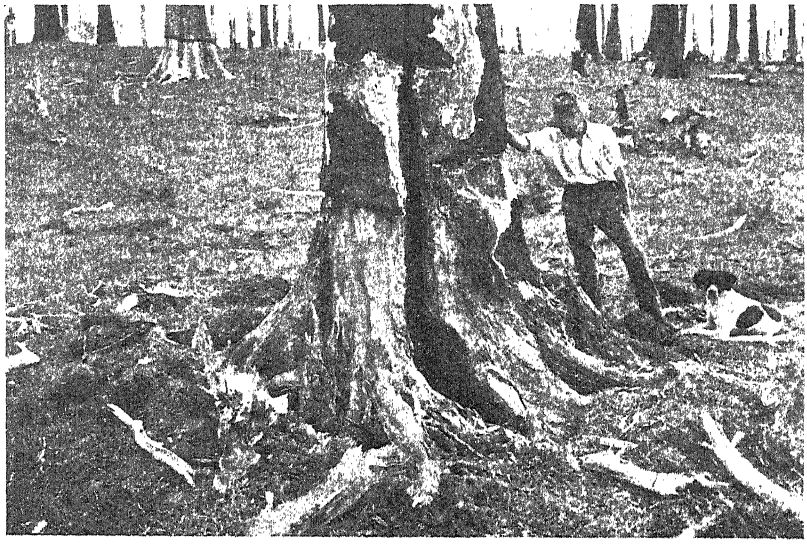
orchard lands in the position that will be afterwards occupied by the trees. The charge varies with the nature and condition of the subsoil, but may range from one, to one and a half or possibly two cartridges. It will be found that the soil will be disturbed to a radius of 8 or 9 feet from the charge.



Effect of 12 lb. of rack-a-rock on a huge tallow-wood stump. Mr. H. B. Faviell's farm, Bonville, Autumn, 1912.

In very heavy, retentive subsoils, it may be necessary to still further increase the amount of the charge. An excavation made occasionally a few feet away from an exploded charge will enable the operator to form a very good idea of the nature of the work performed by any given amount, and this will act as a reliable guide to future work.

For best results, it is essential that the subsoil be fairly dry. Where it is of a shale or slate formation this is not so important, but a large proportion of lands that could be greatly improved have clay subsoils. If charges are exploded while the clay is wet or saturated, the plastic condition causes it to yield, and an excavation is made, but without those series of fissures so desirable. If, however, the work be done when the clay is dry or nearly so,



The value of explosives in blowing out the earth and shattering the barrels of trees, so that a good fire can be started. Mr. H. B. Faviell's farm, Bonville, Autumn, 1912.

the effect of explosives is seen in the breaking rather than the stretching of the clay, and openings or fissures will be produced in all directions. Care and judgment have to be exercised in this work, so that thorough and perfect drainage is not interfered with. Charges exploded indiscriminately may result in a number of fissures being produced that may act as receptacles for water. On slopes especially, the arrangement of charges should be such that the fissures are connected and facilitate drainage operations. This means that small charges arranged in lines and fairly close together should be used in preference to large charges a greater distance apart.

Goods results can be also obtained in excavation work, gravel pits, tank and well sinking, &c.

Though it is difficult to accurately determine results, it is evident from experiments that have been carried out that a considerable saving can be effected, ranging from 25 to 50 per cent. in cost and time.

In conclusion, it is necessary to add that in order to avoid accident it is essential that this class of work be undertaken only by sober, intelligent and responsible individuals. No class of explosive can be played with or carelessly handled without courting disaster. The detonators particularly should be most carefully handled at all times, as any undue concussion will cause them to explode. Where, however, every reasonable care is exercised and the working instructions of the manufacturers are strictly and faithfully observed, there is little danger involved, and their use will be found a means



Public demonstration given by G. Marks, Inspector of Agriculture, at Mr. G. Eaton's farm, Nimbin. After the explosion—a large mahogany stump, 9 feet in diameter at ground level, lifted out and shattered by 5 lb. of gelignite.

of doing a great deal of useful and powerful work that, carried out by ordinary methods, would entail a great deal of labour, time and expense.

All explosives, when not in use, should be securely stored in a properly constructed magazine, which should always be kept locked. Only those amounts required for immediate use should be removed at a time. The charging, connecting the wires and cables, and firing should be entrusted to one man only, who should also prevent any interference with or handling of any of the materials employed.

[NOTE.—If a man wishes to keep explosives on his premises to any extent exceeding 25 lb. at one time, he must obtain a license under the Explosives

Act, and build a proper receptable for a magazine. The fee for the license varies; up to 300 lb. it is 10s. per annum. Before rack-a-rock can be used, it is necessary to obtain another license to "manufacture" it (*i.e.*, dip the chemical in the oil). The fee for this is 5s. per annum.

The Inspectors under the Explosives Act are the local police, who will supply all information.—Ed.]



Public demonstration at Nimbin; about 80 people present.

Smutted Wheat for Poultry Feed.

The Department of Agriculture gives a word of warning to suburban and other poultry-keepers who, in their desire to obtain the cheapest poultry feed, purchase smutted wheat. A case occurred recently where fowls and chickens were dying in rather large numbers, and the poultry-keepers submitted samples of the feed (grain, bran and pollard) to the Department of Agriculture, for advice on the matter. Chemical examination showed that the pollard was of inferior quality and contained smut, and that the wheat was badly infected. Whilst no official record is known of the death of fowls through eating smutted wheat, instances have been recorded of sudden drops in the egg production.

In animals, the symptoms in the few cases observed by the Bureau of Microbiology have not agreed very closely, but a paralysing effect on the centres of deglutition and the spinal cord seems to be regularly present. This powerful effect has been attributed to some irritant ptomaines which develop in the plant as waste products of the fungi.

Wagga Growing-Crop Competition.

[The Murrumbidgee Pastoral and Agricultural Association, Wagga, arranged a growing-crop competition this year, and with the approval of the Minister, Mr. H. Ross, Inspector of Agriculture, acted as judge. The following extracts from the report furnished to the Association by Mr. Ross are published for general information.—ED.]

THE season has not been a favourable one; the absence of rain in the early part of October, and the late frosts experienced this year have had the effect of seriously diminishing the wheat yield in your district. Several of the competitors considered it not worth their while to exhibit their crops, and the number of competitors was finally reduced to sixteen.

The following are the names of prize-winners and other competitors in order of merit:—

BEST GROWING CROPS.

First prize, £15; second prize, £7 10s.; third prize, £3.

Order of Merit.	Name.	Address.	Area.	Points.
			acres.	
1st.	Mr. E. Field	Gobbagumbalin ...	200	133
2nd.	Messrs. Lee Bros.	Mangoplah	900	130
3rd.	Mr. J. Bickett	Forest Hill	700	128
4th.	Miss Lintott	Cunningdroo	135	127
5th.	Mr. W. Patterson	Harefield	700	126
6th.	Mr. T. Walsh	Oura	530	126
7th.	Mr. J. H. Taylor	Uranquinty	820	125
8th.	Mr. W. Lee...	,, ...	480	125
9th.	Mr. R. N. Oehms	Harefield	400	124
10th.	Mr. H. Crighton	Uranquinty	820	123
11th.	Mr. H. Haywood	Tootool	260	122
12th.	Messrs. Lyons Bros. ...	Forest Hill	930	122
13th.	Mr. F. A. Griffiths ...	Yathella	400	119
14th.	Mr. C. G. Abbott	Junee	435	118
15th.	Mr. W. J. Dennis	Harefield	400	118
16th.	Mr. H. Lyons	,, ...	330	116

BEST 100 ACRES OF WHEAT, TO BE HARVESTED FOR GRAIN, ON FALLOWED LAND.

First prize, £7 7s.; second prize, £2 2s.; third prize, £1 1s.

Order of Merit.	Name.	Address.	Area.	Points.
			acres.	
1st.	Mr. E. Field	Gobbagumbalin ...	100	134
2nd.	Messrs. Lee Bros.	Mangoplah	100	132
3rd.	Mr. W. Lee	Uranquinty	100	131
4th.	Mr. H. Crighton	Harefield	100	130
5th.	Mr. R. N. Oehms	,, ...	100	127
6th.	Mr. A. F. Griffiths ...	Yathella	100	126
7th.	Mr. W. Patterson	Harefield	100	125
	Mr. J. H. Taylor	Uranquinty	100	125

BEST CROP OF HAY.

Special prize, £2.

Order of Merit.	Name.	Address.	Area.	Points.
			acres.	
1st.	Mr. W. J. Dennis	Harefield	50	129
2nd.	Miss Lintott	Gunningdroo	50	128
3rd.	Mr. J. Bickett	Forest Hill	50	128
4th.	Messrs. Lyons Bros. ...	,, ...	50	126
5th.	Mr. T. Walsh	Oura	50	126
6th.	Mr. W. Patterson	Harefield	50	124
7th.	Mr. F. A. Griffiths .	Yathella	50	122

In arriving at my decision, I have not been influenced entirely by the apparent yield of the crop; trueness to type, suitability of certain varieties for hay, &c., and, above all, cultivation methods have weighed heavily with me when arriving at my conclusions. The competitor who exhibited the heaviest crop did not necessarily gain first, or, for that matter, any of the prizes.

Mr. E. Field, who gained first place in the general crop competition, and also first for the best 100 acres of wheat for grain on fallowed land, obtained this distinction largely through the cultivation methods which he adopts. Mr. Field practises a rigorous system of fallowing with a rotation of crops, and, above all, treats his soil in such a manner so as to replenish that which cannot be artificially added to the soil, *i.e.*, humus. I will, later on, under the heading of "Cultivation Methods," deal more fully with this matter.

In awarding second prize to Messrs. Lee Bros., I had to take into consideration that the whole of their area, 900 acres including headlands, with the exception of 20 acres, was sown with Federation. To use an old saying, "A careful man does not put all his eggs in one basket," and the sowing of such large areas with one kind of wheat is not to be advocated. On this score, Messrs. Lee lost several points.

Quite reverse to the abovementioned instance is the case of Mr. J. Bickett, the third prize winner. On his farm are to be seen numbers of the leading varieties for hay and grain; rotation with lucerne has been practised in some paddocks with very good results; and, but for the fact that the yield on this farm is a little on the light side, the decisions may have been reversed.

In the competition for the best 100 acres of wheat for grain on fallowed land, only eight out of sixteen farmers who entered could compete, because the remainder had not 100 acres of wheat on fallowed land. This is astonishing, when all that has been said and written with regard to fallowing is taken into consideration. It appears that 50 per cent. of the best wheat farmers in the most up-to-date wheat district in the State—one may say the cream of our wheat farmers, with large holdings—have each not 100 acres of crop on fallowed land!

Here again I have to place Mr. E. Field, with 100 acres of Federation, first, and Messrs. Lee Bros. and Mr. W. Lee second and third, respectively.

In the competition for the best 50 acres for hay, Mr. W. J. Dennis takes the only prize awarded. Mr. J. Bickett and Miss Lintott are only 1 point behind the winner, and well in advance of the other competitors.

The cleanest, most true to type, and best all-round crop I have inspected is that of Mr. H. Haywood, Tootool. It is a crop of 40 acres of Firbank. Unfortunately, Mr. Haywood could not enter it for the above competition, as the area was below the required number of 50 acres. So good does this crop appear to me from every point of view, that I would recommend your committee to award a special prize to Mr. Haywood.

Viewing the crops inspected collectively, it cannot be said that, with few exceptions, the best methods have been employed in either cultivation methods, selection of seed, treatment of seed against bunt, or eradication of disease. Hereunder I will deal with some of the principal features separately.

Type.

The type of crop, with a few exceptions, was anything but that which a farmer should aim at producing. Apparently mixed seed has been sown to a large extent.

The question how to procure pure seed true to type naturally presents itself to the farmer's mind, and during my inspection many questions relating to this subject were asked.

The idea generally prevailed that the Government Experiment Farm should grow and sell to farmers sufficient seed wheat for their needs. That such a proposition is not feasible will be seen at a first glance. To provide seed wheat, say, for Riverina only, would mean not one but more than twelve farms in that district alone to cope with the demand for seed wheat. What then, is the farmer to do? Is he to continue sowing his impure seed? Emphatically, no. I would advise farmers to procure from time to time a few bushels of pure seed from one of the Experiment Farms. A few acres of well-fallowed clean land should be set apart, and on this the pure seed should be sown. This operation will, of course, have to be repeated every two years or so, but it is the only solution of a difficult but vital question. The farmer in this way establishes his own stud plots from which to procure pure seed.

Defects and Disease.

In the majority of cases a defective crop becomes so through disease. Of course, this must not be taken as a hard-and-fast rule, as crops may become defective through want of moisture or frost. These two last-mentioned factors were responsible for a fair percentage of defects noticed.

Tipped heads were met with in almost every paddock. This was caused partly through shortage of moisture, and partly through the late frosts experienced this season. The late maturing varieties of wheat, notably

Zealand, suffered severely, whereas the early maturing sorts, such as Firbank and Bunyip, almost entirely escaped. The principal defects in the paddocks inspected, however, were not due to any of the causes aforesaid, but were due to disease, foremost of which was "Take-all."

"Take-all" in Wheat.

As many notions exist regarding this disease, a short description of it may not be out of place.

"Take-all," or "Whitehead," is a fungus existing in the soil, attacking the roots of wheat plants. If the fungus attacks the plant in its early stages, when the wheat is not out in ear, it is termed "Take-all," because it destroys the whole plant. If, however, the plant is not attacked until out in ear or nearly so, it is termed "Whitehead," because the heads turn white. These heads contain no grain. "Take-all" is usually found in round patches of from 3 to 15 feet in diameter. "Take-all" not only thrives on roots of wheat plants, but also on the roots of some of our grasses, notably barley grass. This accounts for the fact that "Take-all" is frequently found in paddocks cultivated for the first time. In such paddocks the "Take-all" fungus has been in existence in the soil probably for many years, feeding and thriving on some of the local grasses. The surest way to eradicate the fungus is to starve it out. Oats of every kind are immune from the attacks of "Take-all"; therefore, if an infested paddock is ploughed and sown with oats, the fungus has no host upon which it can live, and so dies out.

There is a danger, however, that at any time a dust storm may deposit the spores or seed of the fungus from an adjoining dirty paddock on to a clean one; still the chance is a remote one, and farmers are strongly advised to eradicate this disease through the medium of an oat crop.

Bunt or Stinking Smut.

Very little bunt was encountered during my inspection, but I must say that this was due in greater measure to good fortune than to good management. A large percentage of the farmers whom I interviewed took no precaution at all to guard against this disease; others again did so inefficiently, and only a very small percentage treated the seed wheat as it should be treated.

Bunt or smut is a fungus disease, but unlike "Take-all," which exists *in the soil*, the spores of this fungus adhere to the *outside of the grain*. When seed is sown without first destroying these spores (which are the seed of the fungus), they germinate with the wheat, and continue to grow with the wheat plant, living upon its tissue, until, eventually, they reproduce in the wheat ear; the result is the well-known smutty ear. It will be easily seen now that the destruction of these spores adhering to the outside of the grain is of the utmost importance.

The method generally adopted is to dip the seed in a solution of bluestone (sulphate of copper). Take 1½ lb. of bluestone and dissolve it in 10

gallons of water; dip the seed in 1 bushel butts for from three to four minutes, vigorously shaking the bag so that each grain may be thoroughly wetted; allow the seed to drain, and then, while still wet, immerse for a few seconds in lime-water. Lime-water is made by stirring 1 lb. of *unslaked* lime in 10 gallons of water. Allow the lime to settle, then drain off the clear lime-water, and into this steep the bluestoned wheat.

During my inspection I have not met one farmer who had adopted this method; as I have mentioned before, some did not bluestone at all, while others did the work imperfectly.

Cultivation Methods.

A system of fallowing at least a portion of the area under cultivation, appears to be generally adopted in your district; still I venture to say that better returns would be obtained if a yet larger area could be put under crop on fallowed land. The system of working the fallowed land and the methods of sowing leave little to be desired; yet there is something wanting to make the present system more perfect, *i.e.*, a crop rotation.

The continuous cultivation of paddocks with cereals can only have one effect, and that is to deplete the soil of humus. We constantly hear farmers saying, and of course we know from experience, that new land will produce a far better crop than old land. Now, why should this be so? It may be said that successive cropping has taken much plant-food out of the soil. If such were the case this plant-food could easily be replaced artificially; yet no matter how much of every plant-food we put into an old piece of land, we can never obtain the same result as we do from newer land.

The reason of this is obvious: continuous cropping has taken that out of the soil which cannot be supplied artificially, *i.e.*, humus.

Humus is decayed organic matter, and acts as a moisture-retaining agent in the soil. It has frequently been noted by farmers that a particular soil runs together and sets after rain; that soil is deficient in humus.

In order to keep the wheat areas in your district in a permanent state of fertility, it is absolutely necessary that some action should be taken to replenish the humus of which the soil is constantly being depleted. This can best be achieved by sowing a fodder crop, such as rape, to be fed-off with sheep, and the residue ploughed in. No better argument is needed to prove that something of this sort is urgently needed than the existence of so many paddocks which the farmers aptly term "wheat sick."

Varieties of Wheat.

The varieties which are being grown in your district show that the farmers are fully alive to the value of the varieties recommended by the Department. Federation and Bunyip still hold pride of place as grain-yielders. Yandilla King, Marshall's No. 3, Comeback, and other well-known varieties were sown in fair proportion; but one variety, and that one of the best yielders was conspicuous by its absence. I refer to Rymer.

Amongst hay wheats, Firbank appears to be favourite, and rightly so. Let me again remind farmers not to sow this variety earlier than June. Too early sowing of Firbank has been responsible to a marked degree for previous failures.

Rainfall.

The average rainfall during the growing period of the crop was between 9 and 10 inches, a rainfall which on fallowed land is more than ample for the production of a 30-bushel crop, if evenly distributed. As previously pointed out, the distribution during the past season was, however, anything but an even one. The exact records could not be obtained, because only 25 per cent. of the farms inspected had provided themselves with rain-gauges. As the rainfall in a district such as yours is of the utmost importance to anyone connected with agriculture, I cannot too strongly advise those farmers who are without rain-gauges to procure them for next season, in order that they may know exactly the correct rainfall. The rainfall records at the nearest post-office, perhaps 4 or 5 miles away, frequently vary so much from that on the farmer's place that for accurate observations they are useless.

* * * * * *

Conclusion.

There can be no doubt as to the value of these crop competitions; they are a source of education and instruction, not only to the competitors, but to the farmers in the district, and I feel quite sure that, while your committee takes such a keen interest in the education of the farming community, we can with confidence look forward to your district progressing in agricultural education from year to year.

In conclusion, I beg to offer my best thanks to the stewards and farmers who have so hospitably entertained me, and to your secretary for the excellent arrangements made for me during my stay.

Measurements of Hay-stacks.

The weight of a cubic foot of hay is very variable, but the following is generally regarded as a fairly reliable way of estimating the average weight of hay-stacks:—

1. If the stack is extra large and the hay good and loose; or if the stack is large and well sunk; take 400 cubic feet per ton.

2. If the stack is large and the hay good and loose; or if the stack is fairly large and well sunk; take 500 cubic feet per ton.

3. If the stack is fairly large and the hay good, loose and with long stalks; or if the stack is small and very well sunk; take 600 cubic feet per ton.—George Valder.

Flag Smut of Wheat.

J. T. PRIDHAM, Plant Breeder.

ALTHOUGH the disease does not seem to be very common this season, it occurs more or less every year; and as it is much more difficult to control than ball smut or bunt, a short consideration of its behaviour this season at the Cowra Experiment Farm will not be out of place.

The opinion is generally held that sowing in a dry seed-bed following a dry summer is favourable to flag smut, since spores and seed germinate together when the rain comes. On the other hand, if the soil has been moist for some time before sowing, the flag smut spores appear to have lost to some extent their power of infection. This view is borne out by the observations made at Cowra this year.

A large number of the breeding plots were examined, each plot containing on an average ninety-six plants, with the following results :—

In plots of Federation, sown before the rain which brought the drought to an end early in June, 1·053 per cent. flag smut was found in ninety-one plots examined.

In plots of Federation, sown after the rain, ·381 per cent. flag smut was found; forty plots were examined, and these were on upland soil.

In twenty-one plots of Federation on alluvial soil, sown after the rain, ·992 per cent. flag smut was found; thus, in the richer soil, the percentage of flag smut had increased; and it was noticed by the writer in 1910 that the disease was very prevalent on the dark fertile soil of the Wimmera, in Victoria.

The only other variety examined in which the percentage of flag smut was higher than Federation was Allora Spring, which gave 7·291 per cent. in two rows.

Federation would appear to be particularly flag-smut liable, and to transmit this character to its offspring. A cross-bred wheat (Federation x Jonathan x Record), Cowra No. 9, had 3·475 per cent. flag smut from three rows. Of a large number of F2 generation cross-breds examined, in only three of them was flag smut found, and in each case Federation was included in the pedigree in one way or another.

As regards other varieties, no flag smut was found in—

12 rows of Comeback;	6 rows of Steinwedel;
8 „ „ Florence;	3 „ „ Dart's Imperial.
10 „ „ Bayah;	

John Brown showed ·520 per cent. in two rows, and Bobs showed 2·430 per cent. in three rows.

The early maturing varieties were found most liable, but some of these differ greatly in their susceptibility.

The previous history of the paddock in which the above were grown was as follows :—

1911 Algerian Oats ;	1908 Wheat ;
1910 Wheat ;	1907 Tares.
1909 Rape ;	

It should be mentioned that the seed was not perfectly infected before sowing, so that it does not follow that all the above varieties were exposed to the same amount of infection. The seed of the plots examined was not treated with a fungicide before sowing.

At the Wagga Experiment Farm, in 1911, Mr. McDiarmid, the Experimentalist, states that the field manurial trials showed a good deal of flag smut in the crop, though the paddock had not grown wheat since 1904 ; the seed, however, was from a crop affected with flag smut. The seed was pickled with formalin before sowing.

At Cowra, a plant of Federation, in which the lower stools showed flag smut in 1911, had the healthy ears thrashed out by hand. The seed was sown in 1912 without pickling, and out of ninety-one plants resulting, six showed flag smut. It seems at first sight from these two cases as if the disease might sometimes be inherited, but it is exceedingly difficult to be quite sure that any grain is spore-free at the time of sowing, and Mr. McAlpine in his "Smuts of Australia" concludes that the source of infection is confined to contact of seed with spores at threshing time or with diseased stubble in the soil, or by contact of the young shoots with diseased stubble or dung of horses fed on smutted chaff. The following results were obtained by him (*Journal of Agriculture*, Vic., 1910, p. 284) :—

	per cent.
Seed infected with spores, then sown in clean soil	83
„ free from spores and sown in infected soil	52
„ dusted with spores, then treated with bluestone ...	0
„ treated with bluestone, then flag smutted	0
„ „ „ „ and disease straw added ...	29
„ „ „ corrosive sublimate and diseased straw added	44

How long the spores of flag smut retain their infective power, either in the soil or out of it, has not been definitely determined ; hence, the need of an extended rotation, and the use of seed from a disease-free crop is evident where this disease has made much headway.

Analyses of Basalt Soils from Dorrigo.

In last issue, analyses were given of a number of samples of soil from the land at Dorrigo which was thrown open for settlement in 1906, together with a map showing the approximate positions from which the samples were taken. Some samples were recently taken by the Editor of this *Gazette*, with the aid of Mr. J. W. Johnston, of Dorrigo, to represent the basalt soils in the immediate neighbourhood of Dorrigo itself. These samples were obtained from half to one mile to the westward of the township. Mr. F. B. Guthrie, Chemist of the Department, has analysed these soils, and reports as follows :—

Generally speaking, the soils now examined are of similar type to those dealt with in 1906. The most striking differences are that these soils are generally richer in humus, and consequently have a higher water-retaining power and a higher percentage of nitrogen. These soils are also much richer in phosphoric acid than the soils from the Eastern Division.

All the soils are poor in lime and potash, but are in good mechanical condition, and when sweetened should prove extremely fertile soils, since in addition to their good humus-content they are in good mechanical condition, friable, and of good depth.

When sweetened they should be highly productive. They are at present sour, and even those that have been under cultivation for several years do not appear to have become sweetened. This sourness is no doubt the cause of the grass not taking at first. The addition of lime will be of marked benefit in all cases.

The most noticeable point of difference between soils A and B is the improvement in texture, brought about by tillage, and the consequent improvement in the water-holding capacity of the soil. The soil-nitrogen has also been considerably increased, and to a less extent the lime. Potash has decreased. The soil is still very acid in reaction, and would be improved by liming. Sample C is very poor in lime.

Service of Mares by State-owned Stallions.

The Hon. Minister of Agriculture has approved of a regulation providing that all mares for service by State-owned stallions must conform to the following requirements :—

(a) They must be certified free from hereditary unsoundness by a member of the veterinary staff of the Stock Branch of the Department of Agriculture.

(b) They must be either pure-bred or grade. The progeny of two grades will be considered a mongrel.

(c) They must be of good type and conformation. Mares that ar undersized or markedly deficient in any respect will not be accepted for service.

(d) Arrangements for inspection of mares must be made with the Managers of Farms where stallions are stationed.

ANALYSES of Soils from near Dorrigo Township.

Description of Land.	Colour of Soil.	Reaction.	Capillary Power.	Water Capacity.	Clay.	Moisture.	Volatile.	Nitrogen.	Lime (CaO.)	Potash (K_2O).	Phosphoric Acid (P_2O_5).
			inches.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.	per cent.
A. Rosewood scrub, in its virgin state. Top of hill.	Chocolate.	Strongly acid.	7 Very good.	48 Good.	42·94	7·82	23·95	·294 Good.	·06 Indifferent.	·089 Fair.	·258 Good.
B. Rosewood scrub land, cleared and cultivated with maize and grass for 10 or 12 years. Top of hill.	do	do	8½ Very good.	57 High.	48·81	8·37	25·62	·616 Excellent.	·105 Satisfactory.	·045 Indifferent	·264 Good.
C. Rosewood scrub land, cleared and cultivated 14 years; regarded as slightly inferior to B. Top of hill.	do	do	8 Very good.	48 Good.	43·32	6·47	24·55	·329 Good.	·04 Bad.	·042 Indifferent	·452 Very good
D. Niggerhead scrub in its virgin state. Sloping ground.	do	do	10½ Excellent.	43½ Fair.	37·94	6·0	22·0	·336 Good.	·065 Indifferent.	·056 Fair.	·414 Good.
E. Niggerhead scrub land, cleared and cultivated for 10 or 12 years.	do	do	9¼ Excellent	59 High.	47·84	6·3	15·92	·343 Good.	·084 Indifferent.	·031 Indifferent	·248 Good.

Coff's Harbour and Dorrigo.

J. E. O'GRADY.

CRACKING whips and sweating horses—pine, and pine again! Eastern Dorrigo empties its one marketable native product, from the mills at Ulong, Ashton and Brooklana, down the newly-graded road to Coramba, and thence on to the coast at Coff's Harbour. A railway line is being surveyed up the mountain, and thence across Wild Cattle Creek to Dorrigo itself, but for the present the millers and teamsters are making good use of the curving road, and are thankful for small mercies. Travellers to Dorrigo usually go by the other road through Bellingen.

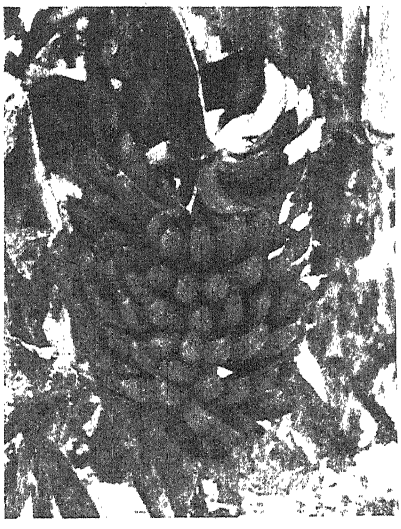
Coff's Harbour has grown up on the timber trade; but of recent years, butter has been taking a prominent part in its development. The slate soils are not so rich as the "big scrub" country to the north, but paspalum thrives wonderfully on the heavy rainfall, and the cow has come to stay. Extensive harbour improvements have been commenced, and it is said that the railway is to go on past Dorrigo to tap the New England tableland, and give a port to the whole of the North-west. Then, it is said, Coff's Harbour will be a big place, shipping wool from Moree, wheat and maize from Inverell, frozen lambs from Armidale and Glen Innes. But at present it is a small place, dealing in butter, some hardwoods and a lot of Dorrigo pine.



Mr. D. Campbell's banana plantation, near Coff's Harbour.
The Pacific Ocean is seen in the background.

Bananas.

The slate soils are neither rich nor deep, but there are many little pockets of alluvial which grow good maize; and along the seaboard there are valleys of rich, dark loam, sheltered from the sea by belts of scrub, and in situations where frosts are practically unknown. Near Macauley's Headland, 6 miles north of Coff's Harbour, Mr. D. Campbell has a banana plantation of 16 or 17 acres. He purchased the place some eighteen months ago, and has extended the plantation considerably. In one case a few acres were planted too close to the sea, with the result that a North Coast storm washed the young trees right out, although they were protected by a breakwind of scrub. The land does not need to be fully cleared of stumps before the bananas are planted, but the keeping down of weeds entails a great deal of labour, and Mr. Campbell is cleaning the plantation up as quickly as possible, so that a scarifier may be used. Banana-growing is proving a profitable industry to him, though so far the produce is all sold locally, mostly on the farm.



A bunch of bananas on the tree.

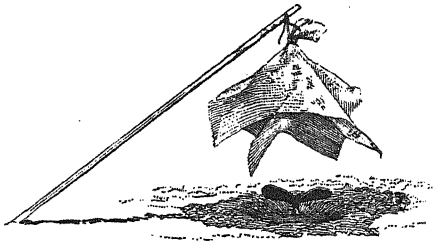
Other Lines.

Tomatoes, pumpkins, and melons are also found profitable in a small way. On the 26th October, wild degenerated tomatoes, growing amongst the scrub near the sea, were fully ripe, and made good eating. No "forcing" assisted their development. When it is noted that at the date named tomatoes were bringing as high as 12s. per case in the Sydney market, readers of Mr. Alford's article in the July *Gazette* will realise the possibilities of the North Coast in this direction.

The pumpkin beetles, troublesome in many parts of the State, reach the dimensions of a terrific pest in the semi-tropical climate of Coff's Harbour. They will eat out the young pumpkin vines in a few minutes. Mr. Campbell has tried various remedies. Arsenate of lead has proved useless this year. Paris-green kept them off one year, but the next year it was a failure. The only vines which have prospered this season are those protected by a piece of paper hanging by a string from a stick driven into the ground in an inclined position, as shown in the sketch. The wind blows the paper about over the young vine, and this keeps the beetles off. It is a simple contrivance, which others may find useful.

Explosives.

At Bonville, between Coff's Harbour and Bellingen, Mr. H. B. Faviell is clearing his land by the aid of explosives, apparently with great success. He claims that, using the explosives in an intelligent way, and studying both the action of the particular explosive and the nature of the timber and of the soil beneath, the cost of clearing is reduced by half. The timber here has been dead many years, and the country is heavily grassed with paspalum. In this issue Mr. George Marks, Inspector of Agriculture, has an article on the subject, and the illustrations will show both the nature of the work and the huge problem which faces the settler who wishes to clear the hardwood lands of the middle North Coast. Amongst several little demonstrations, Mr. Faviell blew out a stump 12 inches in diameter in a few minutes, at a cost of 8d. for materials. The stump was scattered all over the paddock in little pieces, and in its place was a lovely melon-hole of pulverised soil. For his particular conditions, Mr. Faviell usually prefers to make earth-holes with a bar and place the charges under the junction of the large roots, hard up to the wood; but the kind of explosive and the method of its use must be varied to suit the particular problem, the objective usually being to reduce the tree or stump to the best condition for burning. Mr. Marks has given complete information on the whole subject; Mr. Faviell is demonstrating the commercial value of the method.



A simple device against the Pumpkin Beetle.

Ploughing under Difficulties.

But after clearing, begins the problem of cultivation, which is rendered very difficult by the thick mat of paspalum. Six or eight bullocks are required to draw a single-furrow plough through the mass of grass roots. Mr. Faviell holds the opinion that it will not pay to clear such land as that at Bonville for maize or any other grain crop, as maize lands of equal productive quality can be obtained more cheaply in other districts, after allowing for the cost of clearing. The use of explosives reduces the cost, but he recommends that a farmer should clear such land only for Indian cane or other fodder crops for dairy cattle. When the land is once broken-up, a rotation can be practised of cattle-feed crops and grasses; but paspalum should have no place in the rotation, as it is so difficult to get rid of. The uncleared land, of course, will remain under paspalum. The whole district is deficient in lime, and when the North Coast railway is opened, farmers hope that it will be possible to remedy the defect at a reasonable cost.

A Mountain Climb.

The Dorrigo coach leaves Bellingen at 5:30 a.m. The first half of the 20-mile trip is made along the valley of the Bellinger, through beautiful river country devoted to dairying and the cultivation of maize and potatoes; paspalum, couch and clover appear to form the bulk of the pasture. The Bellinger Valley smiles richly with its wealth of produce—the struggles of the pioneer are past.

After breakfast at Never-Never begins the long climb up the Dorrigo cutting, carved out of the side of the mountain, whilst on the right one gets delightful views of river and ocean, farm and forest. As the horses toil up the hill, the scene changes to a purely mountain one, of precipitous gorges, trees and native vines, staghorns, and many coloured scrubs, which will yet make the Dorrigo cutting world-famous as a tourist resort. With almost



Dorrigo, 1906.

violent suddenness, the top of the mountain is reached, and we are on a gently-rolling plateau, partly cleared and sown with grasses, with here and there a piece of chocolate-red soil turned up by the plough. A mile or so further we run into the township of Dorrigo. A photograph was taken for the Government Printer in 1906, and is reproduced here, showing the half-dozen buildings then erected. After some trouble I was able to locate the spot from which it was taken, now an open space amongst suburban residences, and the other photograph, which shows only a portion of Dorrigo, will give readers an idea of the progress made in six years.

A District in the Making.

The history of Dorrigo has been reviewed by Mr. Marks in the *Gazette* for April, 1911, and the development from a cedar-getter's paradise to a rich dairying district sketched out. The timber is still being felled and

burnt, and before the railway reaches the town there will be very little left, as the first fire ruins its commercial value. The district is now chiefly a mass of charred logs, paspalum and rye-grass, only a few of the older farms being fully cleared. The old cedar-getters are mostly gone. One, who took up a selection when the cedar was done, died whilst I was at Dorrigo. For a while they will be remembered, and then Dorrigo will forget them in a world of work. After them, the first settlers, who have felled and burnt the timber, will also pass away ; but Dorrigo will go on developing. Such is the confidence of the people in the future of the district that £15 per foot is being paid for town allotments in good positions.



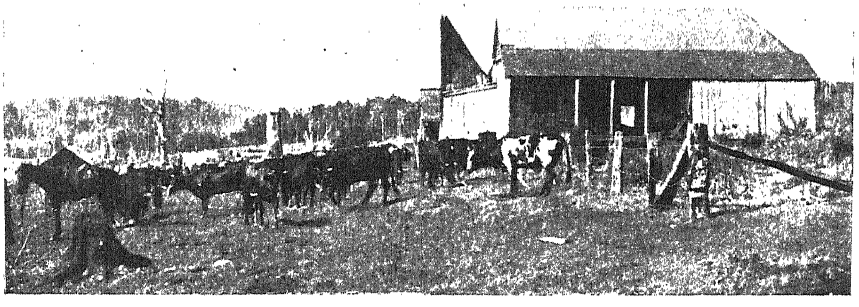
Dorrigo, 1912.

A Porous Soil.

We reached Dorrigo at 11 a.m., in beautiful sunny weather. Before 1 p.m. an inch of rain had been registered, having fallen in a very few minutes. At 2·30 p.m. I arrived at the farm of Mr. J. W. Johnston, and found him ploughing. The rainfall at Dorrigo has been known to reach 166 inches in the year, the "rainy season" being the late summer and autumn. But the red soil is so deep and porous that it is workable almost immediately after heavy rains; drainage problems do not exist. This has one great disadvantage, however, in that occasional short periods of drought do great damage to the pastures. Such a period had been just passed through—some six weeks of fairly dry weather. A western man would laugh at such a thing, but Dorrigo cannot stand it, and the cream returns fell off to an alarming extent. Worse still, the dry weather culminated in extensive forest fires, which destroyed several mills and residences, and did serious harm to settlers whose farms were not ready for a "burn."

A Land of Hope.

Mr. Johnston claims to have felled the first scrub for settlement purposes at Dorrigo, about eighteen years ago. Of course, the cedarmen were at work long before that, but Mr. Johnston had the first scrub fire. "When I came here," he says, "the road up the cutting was only partly made, for the use of the timber-getters. I went straight for settlement. I never saw the black side of Dorrigo, and never lost faith in it. Land of this quality is scarce in New South Wales." These are bold words, but they are from a man who has "made good." Last year he sent over £600 worth of cream to the butter factory, besides selling considerable numbers of pigs and young stock. He has been running from 60 to 80 head of cattle, including young stock, on 100 acres of his land for two or three years. Some of the Dorrigo lands, and not the best, have changed hands at £20 per acre for 100 acres.



Mr. J. W. Johnston's Dairy farm, Dorrigo, 1906.

The first crop at Dorrigo is always cream. It appears to be the only method of utilising the land so as to get an early return. To clear an acre of Dorrigo land, from the virgin scrub to a condition fit for ploughing, would cost, on Mr. Johnston's estimate, about £25—more than the land, cleared and cultivated, is worth. But by felling and burning the scrub, and sowing grasses amongst the logs, the settler can get an early return. Then the cleaning up is done gradually, a little at a time. A lot of the timber rots; a lot is burnt by snatching a fire at an opportune time, and in eight or ten years, if a man is lucky, he has a clean farm. Even then the ground is a mass of surface-roots from the scrub timbers, and covered with a tough sod of paspalum, and the first few ploughings are hard work. But the settler is getting his cream cheques all the time; the climate is beautiful, and breeds optimism; and the town of Dorrigo keeps on growing amongst the burnt logs.

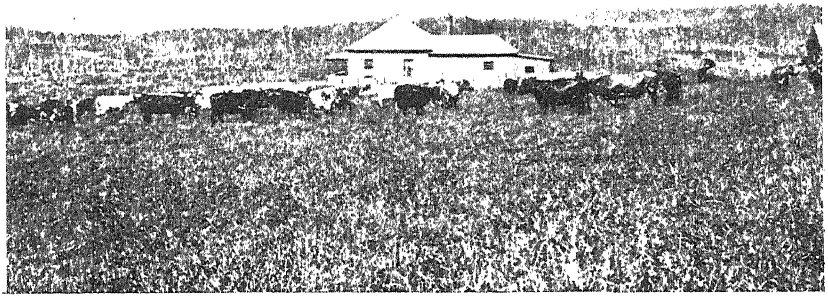
The Need for Communication.

When broken up, the red soils make excellent maize land; but so far, dairying has been more profitable than cropping. The maize cannot be

marketed profitably. Even when turned into pork, the transport of live pigs down the mountain to Bellingen and thence by boat to Sydney is an expensive and risky undertaking ; vessels are sometimes bar-bound for weeks. A movement is now on foot for the establishment of a bacon factory in connection with the local co-operative butter factory ; and this, with the opening of the railway, is expected to give a great impetus to the development of the district. Potatoes also do well, and many other crops give good results. Fruits—principally apples, pears and plums—thrive remarkably well ; and later on, Dorrigo hopes to supply the North Coast with these fruits. Mr. Johnston considers that the ultimate destiny of Dorrigo will be one of mixed-farming ; but at present it is dairying that pays.

Hints from Experience.

Paspalum is by far the best grass to sow first, as it takes best amongst the logs after the first "burn." Later on, when stumps are burnt, some of the



Mr. J. W. Johnston's Dairy farm, Dorrigo, 1912.

paspalum can be burnt too, and other grasses sown. Rye-grass grows all through the winter, and the English grasses generally suit the district well. Of the clovers, Mr. Johnston prefers white for pasture and red for hay. A mixture of grasses and clovers gives the best all-round results.

With present conveniences, Mr. Johnston regards 150 acres of the good red soils of Dorrigo as a living area. He would advise a settler to fell 60 acres of scrub, burn it, sow grass, and put "poddies" on it. They can be bought for 40s. or 50s. a head, while a good cow is worth £8. Poddies can get about where cows cannot, and they are growing into money ; and when they are grown, they will be used to the surroundings, and can be milked right away. The delay is only eight months, and the money saved will support the settler while he is cutting tracks and developing the property for dairying.

With regard to breeds of cattle, Mr. Johnston prefers the Shorthorn or Guernsey-Shorthorn cross, the Guernsey blood improving the butter-yields.

To a man who takes an interest in his cattle, the profits of dairying more than compensate for the continuity of work involved, though a local Irishman describes it as "working the life out of us to keep the life in us."

Classification of Soil.

The Dorrigo basalt soils are not all of the same quality—generally speaking the best soils are on the tops of the hills. Mr. Johnston offers the following general classification, based upon the nature of the timbers—a basis recognised as sound in all districts of the State.

First quality: Rosewood scrub. The chief scrub timbers are rosewood, carrabean, ironwood, cherry, broad-leaved nettle, marblewood and prickly ash; all interwoven with immense water-vines. These water-vines are a sure indication of good country. It was generally in the rosewood scrub that the cedar grew, and the stumps of cedars and brushed tracks of the timbermen are found throughout. In its virgin state, rosewood scrub is unlike anything to be seen in inland districts. The softwood trees grow straight upwards in their endeavour to reach the light, and the tops form an immense canopy, through which the sun never shines. The ground is a mass of tangled roots, so that I had some difficulty in obtaining a sample of the soil for analysis by Mr. Guthrie. Giant rosewoods occur here and there, some containing 8,000 to 10,000 superficial feet, worth 25s. per hundred, or probably over £100 per tree—the value of 5 acres of the best cleared land in a single tree! And the pity of it all is that many of them are converted into smoke and ashes, owing to the difficulty of getting the logs away.

Second quality: Niggerhead scrub. Niggerhead (or "Negrohead Beech") is a semi-hardwood. Sassafras, beefwood, and some other timbers are found in this class of scrub, which generally occurs on the slopes and flats. It is not generally regarded as equal to rosewood country, as the grass does not usually "take" so well; but some niggerhead lands are very highly esteemed.

Third quality: Leather-jacket country. Prickly ash, and some other timbers also occur. This is inferior to niggerhead scrub lands.

But in a few years the red soils will not be classified by their timbers, for the timbers will be all gone. There are probably 50,000 acres of such land around Dorrigo, fast being fitted for dairying. Mixed-farming may be its future, but one cannot help the fancy that the deep, porous, violet-red soils which grew the cedar and the rosewood will find their ultimate destiny in some product which will gratify the most delicate appetite, or please the most fastidious eye—some crop or product which will make Dorrigo a household word in the homes of the wealthy throughout the world.

To the North-east.

I was fortunate enough to accompany Mr. McPherson, Conditional Purchase Inspector, on a trip as far as Wild Cattle Creek, on the road from Dorrigo to Coramba. This road has only been opened a year or two, for the purpose of giving access to the Eastern Dorrigo settlers. A mail coach is

now running to connect with the Grafton-Coff's Harbour coach at Coramba, whilst the road has opened up a lot of the pine country on the north-eastern fall of the tableland. The area between Dorrigo and Wild Cattle Creek, and further on towards Ulong, was thrown open for conditional purchase lease in 1906. The blocks were freely advertised, and a great "rush" occurred. Some of the settlers are experienced men, but most of them followed other occupations than farming before coming to Dorrigo. The most successful men appear to be those who are used to bush work, and can help to obtain a living in the early days of their farms by working for others.

At a distance of only a couple of miles from Dorrigo, the appearance of the country begins to change. It is much more broken and hilly, the road curving sharply round the gullies. The soil also changes to a yellowish-brown, with a fiery-red subsoil, seen in the road cuttings at varying depths. The underlying rock also outcrops in places. Several specimens were taken between Dorrigo and Wild Cattle Creek, and the Mines Department has named them all as clay-shale. Throughout the district, however, there are many large patches of chocolate soil.

The scrub is also being cleared from this land, and paspalum has been sown. In some places it has failed to take—in others it has a good hold. But it is not fair to judge the country upon its appearance at the time of my visit, as it had suffered severely from drought and fire.

Mr. McPherson considers that this land has a future in fruit-growing—apples, peaches, nectarines. The red Dorrigo soils are too rich and open, and the trees make too much wood-growth, but on the yellow lands the conditions are much more favourable.

A Land of Work.

On Mr. Tom Rogan's selection, the scrub is gone, and the grass has a good hold. Mr. Rogan was a South Coast farmer, and came to Dorrigo five years ago. He maintains that the yellow soil takes grass quicker than the red. Paspalum and cocksfoot are growing well on his farm, and he has had no trouble in growing potatoes for home use.

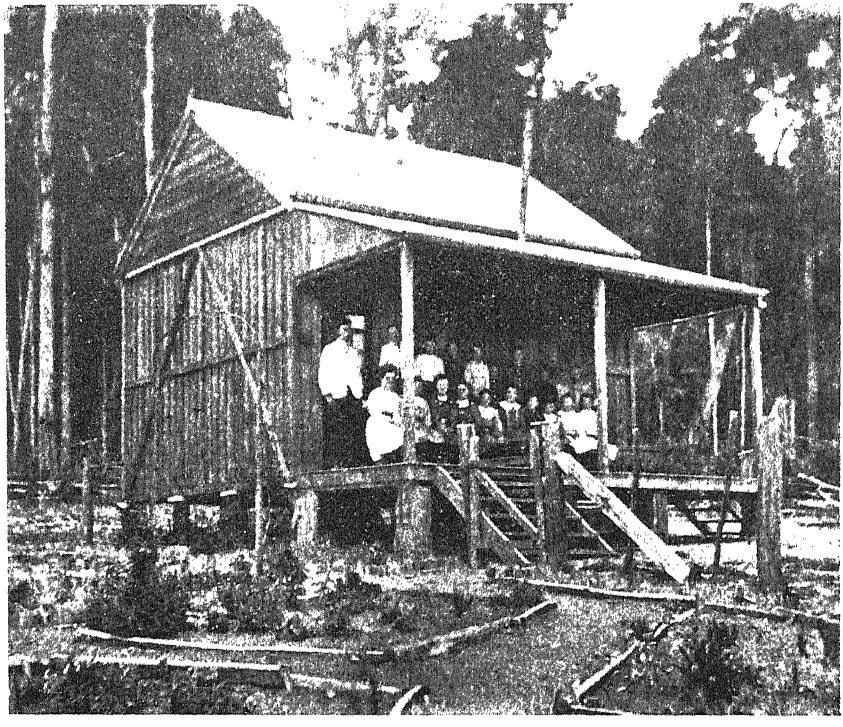
Mr. Rogan advises a man without capital to keep away from Dorrigo unless he is prepared to "graft." A married man should keep away unless he has sons who will stick to him.

A fair living area on such country would be about 250 acres. The settler should, in Mr. Rogan's opinion, fell about 100 acres in the first winter, and fire it about Christmas. It is waste to burn good pine, beech, and other marketable timbers, but he cannot get it out until he has grass, as bullock teams cannot come in. By burning and grassing 100 acres at first, he can get the valuable timber out from the rest of his land before firing it, and if he is within a reasonable distance of a sawmill, the return will help him along considerably. The final clearing can then be done at the rate of 20 or 30 acres each year.

After sowing grass on the 100 acres, the settler should let the paspalum go to seed without carrying large stock. The seed shakes out and springs up

again, and the result is a good sole of grass among the logs. Poddies, however, can be run on the young grass, and a dozen poddies will not prevent it from seeding, whilst they will be growing into money.

About three years after taking up the land large stock can be put on. The 100 acres of good grass, with not too many logs, ought to run 25 or 30 head of cattle all the year round. Dairying can then be commenced, and the settler can then begin to make a living from his farm three or four years after taking it up. The great danger to avoid is overstocking. Any area proposed to be cultivated should not, in Mr. Rogan's opinion, be sown with paspalum at all, as it is so difficult to plough it out.



Leigh Public School, Dorrigo.
Some of the children walk 6 miles to this school—12 miles per day.

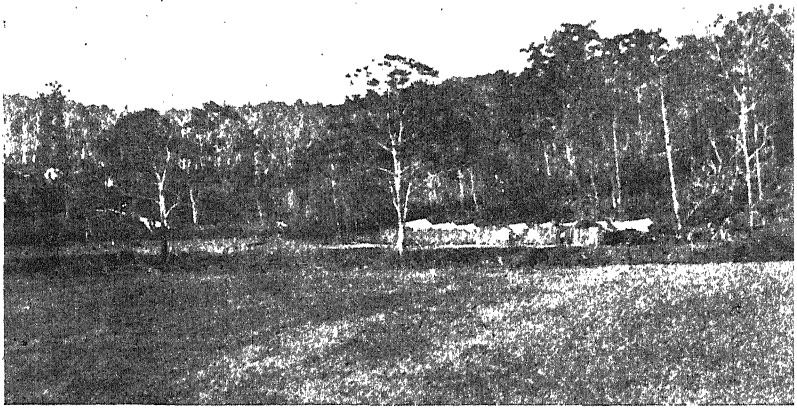
Waste of Timber.

On past Leigh Public School, of which a photograph was taken, the country is of similar character. Excellent roads have been made for the selectors—an honest recognition by the Government of their difficulties, and an attempt to make the conditions of pioneering life easier for them. Pine now begins to take a part in the forest growth—the graceful Dorrigo pine, with its round barrel, tall trunk, and drooping arms. But most of the specimens seen along the road are blighted by the settlers' first fire. They

are usually left standing, perhaps with an idea that they may escape damage, perhaps because they are so difficult to burn on the ground. In any case, whether felled or not, they are ruined by the first burn.

Overstocking.

Mr. D. L. Ridley concurs in most of Mr. Rogan's recommendations. He considers that the desire for an early return has impelled the settlers to overstock before the grass is strong enough. He advocates that settlers should be compelled to spend money in improvements—clearing, fencing and grassing—but that they should not be compelled to reside on their farms for the first few years. Those who have other means of livelihood can thus spend their capital on their properties without having to look for a return from the milk-pail before the country is fit to carry large stock.



Railway Survey Camp on Wild Cattle Creek, Dorrigo.
Mr. Rouse's cultivated land in the foreground.

From Coalmine to Selection.

Mr. J. V. Rouse's property fronts Wild Cattle Creek. There is a strip of hardwood country along the creek, and Mr. Rouse has cleared and cultivated some of the flat. Good crops of maize and potatoes have been grown there. The balance of the land hereabouts is similar to that just described.

Mr. Rouse was a Newcastle miner, with no farming experience; but in sending cream from this region to Dorrigo he is in the front rank. He had the misfortune to have a "bad burn"—a misfortune which hangs like a millstone round the neck of a Dorrigo selector for many years. In his inexperience, a settler will fire his scrub, or a bush fire will catch it before it has been down long enough. The result is that only the leaves and twigs burn, and the paddock is left a tangled mass of timber through which

grass cannot grow, and among which stock cannot get about. The labour thus rendered necessary to clean the paddock up comes very hard on a man already overloaded with work, and anxious to get some return.

Make Nature Help.

Mr. Rouse's advice to a new settler, based on experience dearly bought, is as follows:—

(1) Get down as much scrub as possible.

(2) Burn about nine months afterwards. Select a dry day, with westerly winds and very little moisture in the air.

(3) Sow paspalum in the ashes, on the north and east slopes, in October or November, immediately after the burn. Sow cocksfoot at the end of February on the southerly slopes; if sown earlier, the sun will kill it out. Be sure to get good cocksfoot seed. The paspalum is intended for summer, and the cocksfoot for winter feed.

(4) After three or four years, during which the land is not heavily stocked, go in for a "grass-fire." Take the stock off, and let the grass go to seed. Leave it till October, when the grass will be over the logs and quite dry. Then set fire to the paddock, and practically everything will burn except the big logs. A neighbour, with Richmond River experience, cured a "bad burn" very successfully in this way, being amused at the efforts of the "new chums," who did not know the dodge, and spent an enormous amount of labour heaping up logs to burn. After the grass-fire, the grass shoots again after the first rain, and the cattle can be put back in a month.

Mr. Rouse believes in paddocking, and "spelling" the paddocks. Sometimes, when the grass is growing well, a fortnight's spell is enough. About the end of February he locks up a cocksfoot paddock for the winter, and does not put cows in until the end of May. With clover growing amongst the cocksfoot, winter-feed is assured. But clover will not "take" with the paspalum after the first burn. It should be sown in April or May, two or three years after the burn. Rye grass has not been a success with him.

The Value of Bullocks.

Between Wild Cattle Creek and Bobo, Mr. James Sackley has very similar land. He considers that a man should not fell more scrub than he can deal with. A man with £500 capital should be able to make a living from the land in about three years' time. Average land, three years in grass, should carry twenty-five cows to 100 acres. Mr. Sackley has not done any dairying yet, but he bases his estimate upon his experience with bullocks. He recommends a settler to fell 100 acres for a start, and leave it down eighteen months before firing, so as to get a good burn. He "packed" the logs up after the fire; the cost of the work would have been about £2 per acre if labour had been employed. A running fire through the grass last September did the place a lot of good—he got his bullocks to work after it and packed up more of the

logs. Paspalum and clover, and rye grass and clover, are the grasses he recommends. He estimates felling at 30s. per acre ; grass seed £1 ; logging up, £2—or £450 for 100 acres if all is paid for ; but a settler should do the work himself. A man coming on to such country, if he was not prepared to work hard, would need a capital of £1,200 or £1,500.

Most of the men spoken to agreed that a willing worker could reasonably hope for success on this country with a capital of £500 ; many have started with less. They generally speak well of their prospects. It is admitted that the country is poor in lime, and bone-chewing occurs amongst the cattle ; but this difficulty can be overcome by means of suitable licks.

Eastern Dorrigo Timbers.

Mr. Denny Collins, axeman and selector, stepped on the coach for a run down to Ulong. This was an advantage, as he knows the timbers. "You soon get to know them," he says, "because when you go cutting, if you are a new chum, they give you all the hard ones." His own land is largely the brownish-yellow soil with clay subsoil, but he has a strip of red land, and several of his neighbours have large areas of it. On his selection he has maiden's blush, corkwood, ironwood, red and brown carrabean, nettlewood, some bangalows, and—with infinite pride—a lot of small rosewood and a few cedars.

Along the creeks in this locality there are strips of hardwood country—blackbutt, tallow-wood and box, all growing very tall to reach the light. But the bulk of the land carries coachwood or leather-jacket, corkwood, and carrabean. There are also sassafras and jackwood, and gradually the pines become more plentiful. About Bobo Creek a lot of splendid pine has been ruined by fires, but that is stopping now that the road has been made and the mills are working. After passing Bobo and coming down to Brooklana, the view opens away to the right, showing the eastern fall of the Dorrigo tableland, fold upon fold of sloping hills covered with Dorrigo pine—looking more like some scene of Northern Europe than anything usually seen in Australia. No more of it will be burnt, for there is now a good road, the mills are working, and there is going to be a railway soon. But the curving road soon takes us below the altitude of the pine ; and, after dinner at Ulong, we run through hardwood country down the mountain to Coramba, and there change to the coach from Grafton, which takes us on through the coastal dairying lowlands to Coff's Harbour.

Cracking whips and sweating horses—pine, and pine again !

Bacon for Export.

E. J. SHELTON, Pig and Bacon Expert, Hawkesbury Agricultural College.

UNDER instructions, I recently made a tour of the Richmond River district in company with Mr. J. E. Prossor, English expert in bacon-curing and bacon factory construction. Arriving at Byron Bay on the morning of 15th July, we went to the North Coast Co-operative Co.'s Bacon Factory, situated within half a mile of that town. Mr. Prossor's arrival at Byron Bay preceded mine by about a week, and in that time he had made practically all the introductory arrangements for the demonstrations that were to follow.

The Type of Pig.

Comparing the type of pig which the New South Wales market requires with that which Mr. Prossor recommends for export, it will be found that in the former case good type Berkshire or Berkshire crosses are most suitable. The age should be from five to six months, and the weight when alive not more than 160 lb., the favourite size being 120 lb. dressed. For export, the pig ought to scale 200 lb., live weight. The following shows a comparison between the two types :—

	Export.	Local.
	lb.	lb.
Live weight of animal	200	160
Twenty-five per cent. difference between live and dressed weight	50	40
Dressed weight of animal	150	120
Twenty-five per cent. allowed for head, feet, backbone, flakes, trimmings, &c.	38	30
Net weight	112	90

Export, 112 lb., or two sides of 56 lb. each.
Local, 90 lb., or two sides of 45 lb. each.

It must be remembered that bacon exported as "Wiltshire sides," "Cumberland cut," &c., are *green* (unsmoked), and there still remains the peamealing and smoking to be done in England. When the curing is completed, the side, whether sold locally or exported, is further reduced in weight. While, therefore, the exported side weighs 56 lb. when placed on the English market, the local side is always reduced below 45 lb., by the final curing, before it is marketed here. The preparation of bacon for export thus does not entail as much labour and expense at this end as when sides are prepared for the local market, and the loss in weight during

the final preparation is borne by the purchaser in England. This must be remembered when comparing local and English prices. The actual cured weight of the best local bacon is 36 to 38 lb. per side.

At Byron Bay, Kyogle, and other factories, the management have strongly advised farmers to keep more to the medium (120 lb. dressed) types, as up to the present they have been found most suited to the company's requirements for local consumption. For this purpose the medium breeds—Berkshire, Poland-China and Middle York and their crosses—seem most suitable, for though, if properly fed, Tamworth-Berkshire or Large York-Berkshire make the most fleshy type of bacon pig, yet we noticed in almost every instance that when once the farmers got away from the medium types, to Large York, Large Black, and Tamworth crosses, the pigs were, in order to meet the factories' requirements in weight, sent in before they were properly conditioned, the result being in many instances their being placed in a lower grade than "A1"—say, in firsts and seconds, for which a correspondingly lower price is paid.

However, in general, Mr. Prossor, Mr. McCallum (managing director of Ellis, Kislingbury, & Co., of Tooley-street, London), and Mr. M. G. B. Jefferson (Australian representative of Messrs. Ellis, Kislingbury, & Co.), admit that they have seen no better pigs anywhere than we have in Australia, and though in far too many cases the care and attention bestowed on the pig might be improved, yet the type is there, and when properly fed and "topped up," and cured ready for export, the pigs are eminently suited for London and provincial markets; provided always that the sides turn the scales at 56 lb., or as near that weight as possible, and have an even strip of back fat 1½ inches thick, with good thick plate.

Feeding.

Regarding the feeding, apart from the fault already referred to, in sending pigs in "proper weight" but not well fattened, the system needs but little alteration. Many improvements have been suggested, chief amongst which comes the pasteurisation of all milk fed to pigs. Until this is strictly carried out, diseases which at present cause considerable loss (especially tuberculosis) cannot be kept in check.

It is noticeable that farmers are growing and conserving more feed now than has been the rule in the past, and in a district where all classes of crops suitable for pigs (such as maize, sorghum, root crops and grasses) grow luxuriantly, the actual cost of the production of the pork should be considerably reduced. The bulk of the pigs received at the various factories are milk fed, such feeds as pollard, maize, sweet potatoes, peas, &c., being largely used at or approaching "topping up" period.

With the natural advantage of a heavy rainfall, and an abundance of water always available from rivers, creeks, &c., it is not be wondered at that pig-breeding is going ahead rapidly; yet there is room for expansion on almost every farm. One up-to-date farmer spoken to, admitted having made

large cheques out of his pigs in the early days, but said it was hard work then, and they did not get 5½d. per lb. for their pigs as they are getting to-day, with up-to-date bacon factories to tell them what type to breed and what feeds to use.

General Attention to Pigs.

Though it was apparent that a considerable number of pigs came from farms where the best methods are observed in breeding, feeding and general management, it was not difficult to pick out those from farms where the pig seems to be a nuisance, and is only kept to "eat up the scraps." Fortunately farmers everywhere around seemed to realise that they were not making sufficient out of pigs, and so the demand for breeding stock has been very keen. Pure-bred stock have been purchased extensively to improve the common type in use, and the future of the pig trade on the Northern Rivers seems assured.

The various bacon factories must be congratulated on their efforts to induce farmers to send in animals of better quality. This is done chiefly through the medium of monthly reports, issued to the suppliers, in which the quality and condition of the pigs coming in are discussed, and suggestions made as to what might be done to obtain still higher rates than those ruling. This has been the means of steadily improving the type of pig supplied, and thus ensuring for the bacon produced a better place on the markets of this and sister States.

Receiving the Pigs at the Factory.

Prior to trucking the pigs to the factory, advice notes are sent stating distinctly the number and breed of the pigs sent. A description of the animals, though brief, is also valuable, for the system in general use of branding with a hot iron brand on some part of the body, though convenient, is not all that could be desired, for the brands are often blurred and indistinct. Ear-marking would appear more suitable; but unless some system of registration of the mark in use was insisted on, a good deal of trouble would probably ensue. A brief description of the pig, giving sex, breed, colour (this would only be a general guide, as most of the brands are taken after the pigs are cleaned), estimated age, and perhaps weights, would, therefore, be of distinct advantage where any doubt existed at all as to the brand. The Companies do all in their power to avoid mistakes; yet if the pigs are not properly marked, the farmer cannot blame anyone but himself for any error that occurs. We may take the operations of the North Coast Co.'s Byron Bay Factory as typical of what has been found most suitable for local conditions. Their methods are in any case well worth description, as this is by far the largest bacon-curing concern on the rivers.

The pigs received at the Railway Goods Yards have arrived by train from the various stations along the line from Tweed Heads (33 miles) to Grafton (114 miles). Shipments come from as far south as Coff's Habour, which is over 100 miles from the Bay. These are unloaded from the steamer into

trucks for delivery at the Factory's platform. A certain number are received at the slaughter yards per cart from farms in the vicinity. As the trucks are placed at the platform where the pigs are unloaded, they are counted out by a receiving clerk. He keeps count of the number in each truck, and a record of the station where the pigs were loaded. Should any of the pigs have received injuries, and come out of the truck unable to walk, they are kept at the platform and carted to the feeding sheds, where they are given whatever attention is necessary.

From the unloading platform, the pigs are driven down a race to the receiving yards (at Byron Bay this race is about half a mile long), where they are again counted by the Foreman of the Slaughter Yards, who takes the receiving clerk's count, checks it with his own, and forwards both to Head Office. The pigs are then penned in the resting yards, where a plentiful supply of clean cold water (and feed if necessary) is available. After twenty-four hours rest they are drafted into the killing pen, where they are stunned with either a pole-axe or a heavy hammer, and passed into the bleeding passage, where the sticking is done.

Thorough bleeding is important, as unless the blood is well drained from the system, the meat will not cure well. The blood is collected and sent into the drying machine, eventually being sold as "dried blood."

Scalding.

Where machinery is available (as it is at Byron Bay) for dehairing and polishing the pigs, the operations are somewhat different to those at smaller factories. Here the pigs, after being stunned and well bled, are passed through a sliding door on to an inclined plane leading to the rear of the scalding vat, which is large enough to hold up to twenty pigs at one time. The man in charge of this work has perhaps one of the most important operations in the whole of the business to attend to, for though the work seems simple enough, yet there are many points to be looked for, as variations in scalding may mean either a reduction or an increase in the number of hands employed in the finishing off of the pigs after they have been through the machine.

The temperature of the water must be kept at from 150 degrees F. to 165 degrees F., the variation being necessary for the class of pig scalded; old and heavy pigs require the water at a higher temperature, or to stay longer in the water at a lower temperature, than those having soft skins, particularly well fed, fat pigs. The hog-scraping machine at Byron Bay has a capacity of 150 to 200 pigs per hour, and is without doubt a wonderful contrivance. It would be somewhat difficult to describe the machine, but the work is accomplished as follows:—

Scraping.

An automatic endless elevator (or carrier) delivers the pigs from the scalding vat into the machine (thus saving handling and the use of hooks either in the jaw or in the gambrels). From the mouth of the machine

the pigs are propelled horizontally through the scraper, at the same time being revolved by a number of cast-iron spirals. Whilst passing through, the pig comes in contact with a set of rubber and canvas belting beaters, to which are attached steel scrapers. These belts are attached to one single shaft, which is fixed above the spirals, and which, as it revolves, causes the beaters and scrapers to strike the carcase, and in an instant remove the scurf, hair, &c., the pig meanwhile revolving, so that the machine not only scrapes off the hair, but also all scurf, bloodstains, &c. on the skin, and also in small pigs, the toe-nails. The head, feet, ears, and tail are all cleaned, and in such a manner that as the pig is automatically thrown out of the machine on to the scuttling table, very little work requires to be done to have it sufficiently clean and ready to be rolled down into the vat of hot water which is placed between the scuttling table and the disembowelling platform. In smaller factories, where the scraping machine is not used, the system of cleaning, &c., is much the same as that previously described in the *Gazette*.

Cutting-up.

As soon as the remaining hair and scurf are all removed, the pig is hoisted on to a track bar for disembowelling, a process that needs to be attended to by an expert hand, one who can use a knife well. As little water as possible should be used in washing out the carcase, which is then passed on to the Government Meat Inspector, who has his bench alongside the place where the pigs are opened.

The Inspector passes or condemns the carcases according to their condition and freedom or otherwise from disease. The condemned ones are sent direct to the digester, where they are thoroughly cooked, and eventually appear again in the form of fertiliser. The carcases passed now have the fore legs cramped back to make the side appear more shapely, and to draw the blade bone as far into the shoulder as it will come, and thus reduce the labour in removing it. Continuing on this same track bar, the carcase is next opened down the back, and the backbone exposed. Another man then chops down the backbone, leaving the sides attached by a piece of skin at the neck. The flakes of kidney fat, together with the kidneys, are now loosened and hung over the gambrel. The sides are now allowed to cool and set, after which they are placed in a travelling truck, and sent off to the factory for weighing. This weighing includes the two sides, head, feet and flakes; a percentage is allowed for shrinkage.

The pigs available for export were marked and kept separate, and placed in the chill room, where the temperature was slowly reduced to 38 degrees F. The next day, when the sides were chilled sufficiently, as ascertained by means of a meat thermometer which should register 38 to 40 degrees F., they were cut up and trimmed, head and backbone removed, and the sides prepared either as—

Wiltshire cut;
Cumberland cut; or
Hams, Shoulders, and Middles.

Wiltshire Cut.

In the "Wiltshire Cut," it is necessary to remove the shoulder blade (scapula), and the socket covering the head of the upper thigh or hip bone, called the "Aitch Bone;" and a good deal of practice is necessary before one becomes expert at this work. Unless properly done, a good deal of waste meat will result, and the "pockets" be too large. The "Pocket-hole" is the opening out of which the blade bone comes, and it should not be larger than absolutely necessary. Care must also be taken in exposing the head of the hip bone to cut away as little meat as possible. The fore leg is now cut off. There is general objection to both these bones being removed under Australian conditions, but the export market requires their removal, and top prices can only be obtained by giving the consumer exactly what he requires, and "Wiltshire Cut" realises the best prices on the London market.

Kyogle.

From Byron Bay we proceeded to the Kyogle Co-operative Dairy Company's Bacon Factory, where, owing to the greater proportion of the pigs being suited to the local trade, few were heavy enough for export. However, those available were of very good quality; in fact, the whole of the pigs received at this factory were of high quality, and the management are to be congratulated on having induced farmers to breed a better type. The machinery and cold store space at this factory are intended for a supply of from 150 to 200 pigs per week. This suits the district well, for it is but a few years since the whole of this district was used as a grazing area. The slaughtering arrangements are very complete. All the dehairing is done by hand. The general treatment given to the carcases from time of receiving at the factory (most of the pigs here are received by cart) till cured and ready for export, was similar to that already described.

Coraki.

A visit was paid to the Coraki Co-operative Butter and Refrigerating Company, where the Directors have under consideration the erection of a bacon factory to treat up to 200 pigs per week. A suitable site is available, and the supply of pigs would be received by river steamer from the various townships along the Richmond River, and per cart from neighbouring farms.

The district is specially suited for pig-raising, as dairying is general, and all classes of crops grow well, from which the food supply of the pigs would be obtained.

Conclusions.

The prospects of an export outlet for our bacon are eminently satisfactory. With an ideal climate for pig-raising, unequalled facilities for the growing of suitable crops, and a marked freedom from disease, we can compete on far more even terms than would appear on the surface, with countries much closer to the home markets.

The fluctuations in the local prices have hitherto handicapped the industry, and the export trade will level up values from season to season just as it has in the butter trade. Under present conditions there are periods when the

prices obtainable for pig products on the local market will give a higher net profit than can be obtained by exporting to England; but there are also periods when local prices are so low as to be altogether unprofitable to the grower. These periodical low prices discourage the industry and prevent its expansion. When the export trade is developed, there will be no need to fear gluts in the market, as only so much produce will be retained here as will be required for local consumption. Prices will thus level up and be much more uniformly profitable than they are now. The same thing has happened with the dairying industry, which could make no great progress until the export trade in butter was developed.

In one respect, however, there is a main difference between the butter and the bacon trades. With the former, there never was any substantial distinction between the tastes of the State and of oversea consumers, and no alteration of systems at the place of production was necessary. With the bacon industry the conditions are different. As has already been pointed out, the local market demands a small side, and to secure this at six months old, the medium sized breed gives the greatest satisfaction. While the Berkshire–Poland China has up to the present been the favourite, there are evidences that on the North Coast of New South Wales and in Southern Queensland the Middle York–Berkshire is even better. A letter to the Principal from a Kyogle resident states that the progeny of a Middle York boar supplied by the College are "splendid. The management at the bacon factory say they are the best class of pigs here. They have been sent to the factory at twenty-one weeks old, and weighed (dressed) 118 lb." The very pig which the export trade prefers is placed by local factories in the first and second grades, as against the A1 class, comprising the lighter and chubbier types.

The representatives of the export trade have stated, however, that the type of pig already supplied to the factories for local consumption would make an admirable export bacon with an extra two months' growth; or, in other words, the Berkshire–Poland China and Middle York crosses at eight months old will supply the oversea trade almost as well as the Large York, Tamworth, and Large Black crosses at six months.

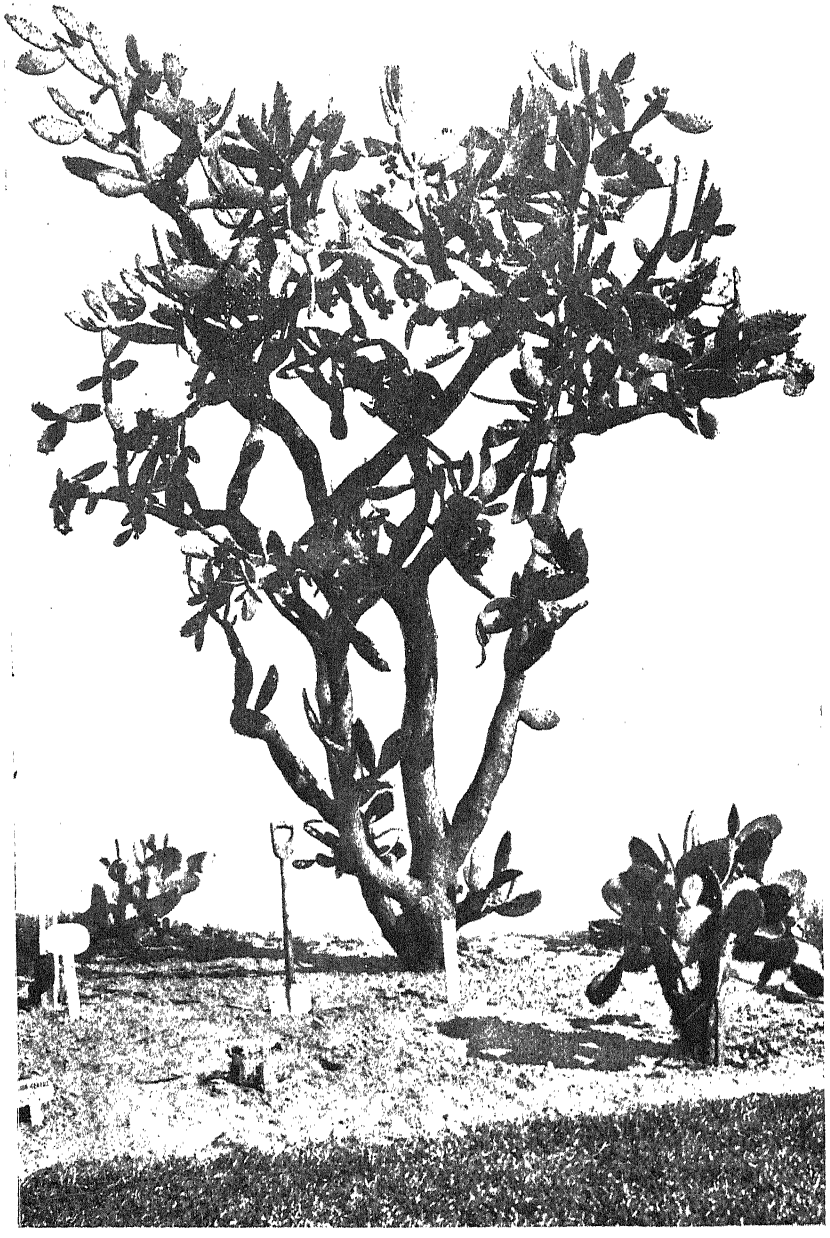
While, then, it seems unwise at present to recommend the wholesale rearrangement of existing methods in pork production by the replacement of present boars with those of a larger type, thereby excluding from the local market the farmer who does so, or compelling him to accept a 10 to 20 per cent. reduction in price, there is no reason to fear for the export trade. At but a slightly higher cost of feeding, the animals can be kept till large enough to furnish the 56-lb. sides, and the factories in their monthly advices can recommend the most profitable market to cater for. There is no doubt that now that such favourable reports of the exported article have been received, and the taste of the consumer fully met, the possibilities of expansion are almost limitless. And once the export trade is placed upon a permanent footing, it will pay the pig-raiser to adopt it as his principal market, and with that end in view to rearrange his stud by the introduction of boars of the larger types.



Opuntia tomentosa, **Botanic Gardens, Sydney**

[See *Gazette*, December, 1912, page 1027.]

THE PRICKLY PEARS OF INTEREST TO AUSTRALIANS.



Opuntia tomentosa, **Botanic Gardens, Sydney.**
[Showing tree-like growth.]

THE PRICKLY PEARS OF INTEREST TO AUSTRALIANS.

The Prickly Pears of Interest to Australians.

J. H. MAIDEN,
Government Botanist, and Director of the Botanic Gardens, Sydney.

No. 6.—The so called "Indian Fig" or "Barbary Fig."

(*Opuntia Ficus-indica*, Mill.)

THE PRINCIPAL PRICKLY PEAR YIELDING EDIBLE FRUIT.

Opuntia Ficus-indica, so called from the old name "Indian Fig," is a tall-growing form, probably the largest of all Opuntias, with large joints, which have comparatively few spines; flowers yellow to orange-coloured, fruits large, barrel-shaped, mottled, and greenish to deep red externally; colour of flesh pale-green to orange. It is somewhat variable, and different botanists recognise various forms by different names.

Speaking generally, it is a nearly spineless form, and most of the experiments undertaken with the view to produce a "spineless Cactus," have been based on this species.

Sometimes the flowers have a pale red tint on the base of the inside of the petals.

The fruit is commonly armed with bunches of spinules arranged equidistantly, and there is a shallow channelled appearance connecting these spinules in a rhomboidal manner, giving the fruits a diamond-shaped aspect, which is often characteristic.

To get rid of the spinules from the fruits, rub them with a serviette, but a far better way is to dip them momentarily into hot water.

Writing in *La Revue Horticole de l'Algérie*, April, 1905, p. 93, M. Robert Roland-Gosselin says:—

> Under the name of Barbary Fig, everyone knows the fruit of *Opuntia Ficus-indica*, naturalised over all the northern shore of the Mediterranean.
> The quality of it is good enough; it is purchased for the Nice confectionery trade, but the use of it is not general
> It is a forlorn fruit, regarded as unworthy of a place on our tables, but it would be certainly an error to say so, as far as the following are concerned.

He then proceeds to enumerate some of the more luscious varieties of this fruit.

The colour of the *outside* of the fruits varies a good deal. Following are some examples in the Botanic Gardens collection:—

(a) Yellowish green. (Nos. 58, 59, 89, 94, 245.)
(b) Perhaps a little greener than the above. (88, 212.)
(c) Orange green. (74, [received as *O. Labouretiana*] 81, 235, 238.)
(d) Claret. (87.)

Colour of Flesh.

Opuntia Ficus-indica is the most important species cultivated in Italy, and many forms are distinguished by the colour of the flesh of the fruits. The principal ones are :—

1. Giarna. Flesh red, sweet.
2. Janca sanguigna. Flesh blood-red, very soft and sweet.
3. Zuccarina. Flesh white, excellent.
4. Surfurina. Sulphur-yellow ; fruit very large, oval.
5. Senza Ariddi. Whitish-yellow, without seeds, excellent.
6. Patanlli. Blood-red, very sweet, large.
7. Russi. Rose-red, sweet.
8. Muscaredda. Nearly white, very soft.

These eight forms, all named or described after the colour of the inside of the fruit, are those distinguished in Palermo, Sicily ; in other districts the names often differ, according to the dialect, but the forms are always distinguished by the colour of the flesh of the fruit.

O. Ficus-indica flourishes up to an altitude of from 4,000 to 5,000 feet (1,500 metres). The limit of the forest is on Mt. Etna, at an altitude of 2,000 metres. (C. Sprenger, in *Tropenpflanzer*, 1901).

Orange-fleshed Forms.

The following forms of *O. Ficus-indica* may be enumerated :—

1. *Opuntia Larreyi*, Weber.
2. *Opuntia Ficus-indica* ; var. *inermis.*
3. *Opuntia elongata*, Haw.

1. *Opuntia Larreyi*, Weber, is one of the finest Mexican varieties. It is large, dull-red in colour outside, with orange-coloured flesh, and comparatively few seeds. It is known as Tuna Camuesa in Mexico.

2. *O. vulgaris*, Tenore, is a synonym of *O. Ficus-indica*. It must, however, not be confused with *O. vulgaris*, which is a very different plant. Confusion has also arisen from the circumstance that an Algerian form has been named *O. Ficus-indica*, var. *inermis*. This name, particularly by horticulturists, has been shortened to *O. inermis*, and thus confusion has arisen with our Pest pear.

3. *Opuntia elongata*, Haw., is another form belonging to the *O. Ficus-indica* group. The plants in the Botanic Gardens have fewer petals, which are orange-coloured ; the flesh is orange.

Plants in the Botanic Gardens collection with orange-coloured flesh, fairly good flavour, are numbered 74, 81, 235, and 238.

Forms with Pale-coloured Flesh.

1. *Opuntia Labouretiana.*
2. *Opuntia lanceolata*, Haw.
3. *Opuntia decumana*, Haw.
4. *Opuntia gymnocarpa*, Weber.

1. *Opuntia Labouretiana* has orange-coloured flowers, red fruit, with pinkish-white flesh. There is a form under cultivation known as *O. Labouretiana*, var. *macrocarpa*, but it does not seem a strong variety. *Opuntia Labouretiana* is described by Roland-Gosselin as a very old Mexican species.

Fruit with the flesh of a marbled rose, very good, and very characteristic, of medium size. Its pleasing appearance renders it very acceptable to confectioners.

2. *Opuntia lanceolata*, Haw., is said by Schumann not to be essentially different from *Opuntia Labouretiana*.

3. *Opuntia decumana*, Haw., of the Sydney Botanic Gardens, has palish yellow flowers, red fruit, with greenish-yellow flesh, and not many seeds.

The *O. decumana* of Nicholson's *Dictionary of Gardening* has, however, orange-coloured flowers, brownish-red fruits, and red flesh. The statement as to red flesh in this connection puzzles me, and I content myself with inviting attention to it. Don gives the flowers as yellow.

Roland-Gosselin describes the following forms :—

(a) *Opuntia ficus-indica with white fruits.* The inside is emerald-green. The seeds smaller than in the type, and less numerous. The fruit is sweet, with slightly musky flavour. This variety is cultivated in Central America at high elevations, and the fruits are largely sold in the markets.

(b) *Opuntia gymnocarpa*, Weber. This is a species (perhaps only a variety of *Ficus-indica*), native of the Argentine. The fruit is large and yellowish, the flesh of a clear green. Flavour excellent, perfumed, sweet, with abundant juice. This should be gathered before the fruit colours all over.

(c) *Opuntia ? species de Cafayate.* Belonging to the same group, this species from mountainous districts in the Argentine, is of large size, and that which, as far as my knowledge goes, gives the largest fruits, of a brick-red, with clear green flesh. The crop is enormous, but it is several years before it freely produces fruits.

The following plants in the Botanic Gardens collection are classified according to the colour of the inside of the flesh :—

(a) White flesh, large crimson seeds, very sweet, not unpleasant flavour (87).

(b) Greenish-white flesh, small seeds, sweet, very pleasant flavour (58, 59, 88, 89, 94, 212, 245).

Opuntia Amyclæa, Tenore.

Under this name every student of *Opuntia* is confronted with forms obviously allied to *O. Ficus-indica*, but more prickly, and displaying some variation. There is a difference of opinion as to whether this form (or forms) is conspecific with *O. Ficus-indica*.

Following are some authoritative writings on *O. Amyclæa*.

A. *O. Amyclæa* (Tenore, *Fl. Neap. Append.* 5, p. 15) joints orbicular or elliptic, very broad, flat, compressed ; prickles strong, diverging, white, without any wool at their base. Native of the kingdom of Naples, near Amyclea, and at Monticelli and Portella, on calcareous rocks. Joints 10 inches broad, and 15 inches long. Prickles 6–18 lines long, but sometimes wanting altogether. Flowers yellow. Fruit reddish yellow. Perhaps the same as *O. maxima*, Salm-Dyck. (Don's *Hist. Gard. and Botany*, iii, 175).

B. *O. Amyclæa* (Ten. *Fl. Neap. App.*, V. 1826) is said to be a form of *Ficus-indica*, but I am not inclined to believe it, because it is said to be armed with 4–6 spines, 2·5 cm. long, in each areola. In our collections, *O. inermis*, P.DC. is frequently found under the name *Amyclæa*. *O. Hernandezii*, P.DC. *Rev.* 69. t. 16, is not well enough defined ; perhaps it represents *O. Amyclæa*. (Schumann's *Gesamtbeschreibung der Kakteen*, pp. 719, 720.)

C. *O. Amyclæa*. Ten., grows taller than *O. Ficus-indica*, and is densely armed with sharp spines, consequently it is extensively used for hedges. Such hedges are impenetrable, especially if overrun with brambles (*Rubus sp.*) ; the hedges may last fifty



OPUNTIA FICUS-INDICA.

EDIBLE-FRUITED PRICKLY PE

years and are often over 10 feet high. Old Opuntia hedges are wonderful collectors of humus. In the most sterile rocky country, thick layers of humus are found after the removal of such a hedge. The fruits are less juicy than those of *O. Ficus-indica*, but one can produce fruits little inferior to those of *O. Ficus-indica* by destroying the flowers formed in May (Italy). A second crop of flowers will be formed on plants so treated, and these late flowers produce fruit nearly as large and sweet as the "Indian figs." *O. Amyclæa* is cultivated in Sicily up to an altitude of 3,000 feet (1,000 metres). (C. Sprenger in *Tropenpflanzer*, 1901.)

D. *Opuntia Amyclæa*, Tenore, is certainly nothing else than a spiny form of *O. Ficus-indica* in its wild state, whilst those commonly known under this name are forms derived by cultivation, with better fruits and fewer spines. In fact, the flowers and fruits of *O. Amyclæa* and *O. Ficus-indica* agree in every respect. (A. Berger in *Gard. Chron.*, XXXIV, 3rd Ser: 93, 1903.)

E. *O. Amyclæa* as figured by Tenore has an orange flower, but this would not separate it from *O. decumana*, which typically is yellow-flowered, because *decumana* varies in colour of flower. (Burkill, "Determinations of the Prickly Pears now wild in India." *Rec. Bot. Survey of India*, iv, p. 289.)

The Sydney specimens of *Opuntia Amyclæa* have yellow flowers and greenish fruit. The flesh is greenish-white. Certainly there is wide range in the colours of the flowers, of the rind, and of the flesh of the fruit of the many forms which are grouped under *Opuntia Ficus-indica*.

There are other names reputed to be synonyms of *Opuntia Ficus-indica*.

Following are some notes translated and extracted from a pamphlet "Projet d'Enquête sur le Cactus considéré comme plante fourragère," by Paul Bourde, Director of Agriculture in Tunis, and published in 1894. They refer to *Opuntia Ficus-indica* :—

There was a great scarcity of fodder in Northern Africa in 1893, and the question has been raised, how to prevent a similar calamity. All vegetation there ceases from June until October.

Opuntia (Indian Fig or Barbary Fig) has been grown in the Mediterranean basin until now, principally for its fruits and use as hedges. It is one of the principal food plants during a certain season. Sometimes it is used as a fodder; 75 kilos (about 1½ cwt.) of straw, mixed with the same quantity of prickly pear joints, are equal to 100 kilos (about 2 cwt.) of hay as regards nourishment of stock. Ninety-five per cent. of the weight of these joints is water. The figs grow upon the joints of the preceding year, and if these joints are given to live stock as a fodder, there will be no harvest of fruit as food for human beings during the following year. Would it be better to cultivate the joints instead of the fruit? This is the point about which an inquiry should be instituted.

One hectare (about 2½ acres) of Opuntia produces about 20,000 kilos (about 20 tons) of fruit ("figs" they are locally called). The fruit is very nutritious, and during a part of the year the Arabs live exclusively on them. They actually grow fat on them during the four months when the fruit is abundant; when that time is past, fast begins.

Analysis has shown that the fruits consist of very wholesome components for human beings as well as for animals; cattle feed on them, as has been proved. All the Opuntias of Tunis (with one exception) belong to the prickly kind. There is such a profusion of prickles on the plants that harvesting causes painful inflammation. Nobody could face this arduous work continually without endangering his health.

The variety of Opuntia wanted must—

(*a*) Bear about 20,000 kilos (20 tons) of fruits to the hectare (2½ acres);
(*b*) Be very nutritious;
(*c*) Be without prickles.

Any single variety having these essential qualities *combined* would be a blessing for Tunis.

The Opuntias, when compared with other plants, have the following merits:—

1. They are cheap to plant, and there are no expenses after the fourth year except for harvesting.

The Arabs like planting in dry ground upon the slopes of hills. In a ground which they take not even the trouble to cultivate, they trace trenches 2 metres apart (6½ feet),

leaving the open space as a path. In these trenches they make holes with a sickle, about 40 cm. (16 inches) apart, throw a little manure into the hole, place the cutting in the dung, and then bring the earth round the foot of the cutting. A plough traces the trenches over a hectare (2½ acres) in half a day, and 8 men can plant one hectare in one day, at an expense of 15 francs (12/-), plus 50 francs (£2) for 5,000 kilos (5 tons) of manure. If they secure an Opuntia without prickles, there would be a further outlay for a hedge.

2. Constancy of harvest during a period longer than the average human life.
3. The moment this provender ripens is just the time of the annual physiological misery for African live-stock.
4. The great yield.

There is no variety known which possesses all the above advantages, and hence an appeal is made to see if one is available in Australia.

So that the use of Opuntia or Prickly Pear (the species figured is the most useful) for fodder is by no means a new idea; indeed, the plant has been so used for ages.

In February, 1908, I visited, by invitation, the dairy farm of a well known gentleman in the Camden district who had been utilising the local Pest pear for twelve months previously. So far as I know, the food value of this pear is much the same as that of the Indian Fig pear.

To convey the pear, he used slides 5 feet 6 inches long and 4 feet 6 inches wide. One slide fills up a half 400-gallon tank, these vessels being cut into two for the purpose of preparing the pear.

These half tanks stand on bricks, with a fire underneath, and the pear becomes more or less cooked, a little water being used. Three bran bags are loosely packed with lucerne hay, and also eight bushels of bran are provided for each two half tanks.

At feeding time the cows were yarded, and a heaped-up kerosene tin of the above pear mixture was put into each cow's trough. The cows were then admitted into the stable. There was no confusion. Each cow deliberately walked to her own particular trough, ate every particle of pear, &c., and then licked her lips for more.

There is no doubt that this pear-mixture is palatable to the cows; to what extent the pear alone is nutritious, it is impossible to say, from the above experiments. I asked the enterprising owner some time afterwards: "The pear is a food; do you like it on your property, or would you rather be without it?" He replied at once, "I would rather be without it."

Let me state some Italian experience (given me by Mr. John W. Shortridge, who lived in Italy many years) in regard to the pear figured. It is there called "Indian Fig," and in the Isle of Capri, 1,500 acres of more or less barren land are planted with it for the Naples market.

In Sicily, Naples, &c., joints are nailed to the walls with the fruits attached, and will be edible and go on ripening for four months.

The plant is also cultivated in Sardinia and the Gulf of Salerno. It is only allowed to grow in stony and bad land—good land is too precious. Land gets "Cactus-sick" after a time, and the Indian Fig dies out in patches, leaving humus.

The plant forms cattle feed in South Italy, particularly for cows. The Holstein or a Holstein-Jersey cross are said to be the best pear-eaters, as they suffer least from the spinules and the few spines of this species. It might be worth while to import some cattle of the best pear-eating strains, through the intermediary of the Italian Government. These cattle also eat the young joints of the spinescent forms.

Following are some notes by C. Sprenger of Naples in *Der Tropenpflanzer*, Berlin, 1901, on the cultivation of the Indian Fig in South Italy :—

The greatest importance of the Opuntia in Sicily does not lie in the fruits, though the consumption is very large, but in the fact that these plants grow on the most sterile, stoneless places, collect humus, and prepare the waste places for better vegetation.

The vitality of the Opuntias is so great that joints that have been lying about for two summers on the bare rocks sweltering in the sun still have taken root when planted.

Joints two years old are the best for planting, though younger ones will do. The joints should be cut from February to April (for South Italy). Seedling plants do not produce fruit before five years, and they do not always come true. Seedling plants yield in every respect better and healthier plants than those raised from cuttings. If a plantation made from cuttings brings a rent for thirty years, the same plantation made from seedling plants would bring rent for fifty years.

A plantation of *O. Ficus-indica* from cuttings brings rent in the third year till the twelfth or fifteenth year; 2,178 plants are calculated to the hectare; if square, thirty-three rows, each with sixty-six plants, they yield 220,000 fruits per year on the average. Such plantation must be hoed two or three times per year, and manured every three years. Chili saltpetre gives excellent results.

The most important service of the Opuntia is its value as manure in parts of Italy, where manure is scarce. The joints of the wild and half-wild Opuntias are collected every year, cut in pieces and used as "green manure" for the olive and almond gardens. Hail is the most dangerous and destructive calamity for Opuntia plantations.

Man has ruined Italy by deforesting it; with the help of the Opuntia it can be gradually reclaimed again.

Rather more than four years ago I inserted the following notice in the Sydney papers :—

I am given to understand that cuttings of so-called spineless prickly pear, stated to be from Mr. Luther Burbank and other Californians, have been imported into New South Wales within the last two or three years. Will anyone who has had experience of such inform your readers of the description given with the plants, the cost of the same, how they turned out, and, if they are still alive, where they are to be seen?

One result of this was that Mr. G. H. Martin, of Sydney, the well known expert on Angora goats, gave me a joint raised from a plant of Burbank's Spineless Prickly Pear, 3 guineas having been paid for one joint from which the plant was raised. Of the authenticity of this plant there is no doubt. The particular joint given me was 21½ inches long by 9 inches broad. It is *Opuntia Ficus-indica*, and in no way different from plants which have been in the Sydney Botanic Gardens for very many years.

I have other "spineless varieties" obtained from Mr. Burbank, and I cannot see in what way they differ from forms which have been long in my care.

It is claimed for Mr. Burbank's forms that they are not fibrous, and hence can be used as a vegetable. The young "joints" of many species and varieties contain but little fibre, but as they grow older they develop the usual network of strong fibre. To be specific, many plants in the Sydney collection are just as non-fibrous as any of Luther Burbank's I have seen. Indeed, if the plant were non-fibrous it would be even more valuable as food for stock than for man.

We have had a lot of experience in Australia in regard to the use of prickly pear for stock. You may singe off the spines if you will; this operation not only gets rid of these formidable weapons; it also partly cooks the pear and renders it more palatable, but *it does not remove the fibre.* The consensus of opinion in the Scone district is that pear is a mere starvation food, and that it is the fibre in the plant which destroys the stock, forming those well-known "hair-balls" or phytobezoars.

Indeed, pear contains so much fibre, and this fibre is so tough and of such excellent quality, that it seems to me reasonable that an important adjunct to the clearing of pear will be the local utilisation of the fibre contained in it I look forward to see stacks of excellent bleached fibre obtained during pear-clearing operations.

We often hear of proposals to utilise pear for the manufacture of alcohol, sugar, fibre for paper and cattle fodder, and the *Bulletin of the Imperial Institute*, viii, 43 (1910), is very severe on proposals which had been made up to that time.

I do not think it economically sound to propose utilisation of pear in any of the above directions as independent enterprises, but possibly one or other of the suggested industries may help to reduce some of the cost in clearing land from pear. When Governments decree that land shall be cleared from pear, a profit will not be looked for, but methods of reducing expenditure will be eagerly tested.

Australian Localities.

Opuntia Ficus-indica in Australia is an unarmed form, which has been cultivated more or less for its fruit, and it has in various places escaped from gardens. Following are some such localities in this State :—

Raymond Terrace (rather common in the bush a few miles north-west of that town), Morpeth (Bishopscourt), Singleton.

It is also found in various Queensland localities.

It will never be a pest, since stock readily feed on it; moreover the individual plants are large and separate, and hence can be readily destroyed if required.

Cocksfoot in New Zealand.

"To the farmer, cocksfoot will always be New Zealand's most important grass, as it forms the basis of the permanent pastures in nearly all parts of the Dominion. . . Up till quite recently nearly all the cocksfoot was grown on steep hillsides, necessitating hand cutting with sickles and hand threshing with flails. Now, however, there is a good deal grown on level ground that can be cut with a reaper and binder, while the portable oil-engine may in time eliminate hand threshing to a large extent."—A. H. Cockayne, in *N.Z. Journal of Agriculture.*

Analyses of New South Wales Wines.

F. B. GUTHRIE and A. L. MUSSO.

In order to obtain information as to the composition of wines manufactured in New South Wales, the Hon. the Minister of Agriculture issued an invitation to wine-growers in the State to forward samples of wines manufactured by them for analysis. It is hoped in this way to make a systematic examination of the locally-manufactured wines, and, incidentally, to furnish the wine-maker with information concerning the points in which his wines are deficient. The investigations will also show the extent to which wine made from the same grape is likely to vary when grown in different parts of the State.

The results of the first three batches forwarded are given below, and results from other growers will be published as they are ready. The names of the growers will not be published, nor the names under which the wines are sold, so that criticism of the results can be unrestricted, without fear of harming the grower.

Series I.

Table I shows the composition of 12 wines from the same vineyard.

On examining the figures for this batch of wines, there are two points which stand out as requiring consideration. In the first place, the acidity is in nearly all cases very high. In the cases of No. 1 (white) and No. 5 (red) the acidity is excessive, and is accompanied by the production of mannite. These wines have undergone what is known as mannitic fermentation, which seriously affects the quality of the wine. This is developed when the temperature rises above 38 degrees Cent. (100 degrees Fahr.). The best temperature for vinification is 86 degrees Fahr., and the temperature should not rise much above, nor fall much below this figure. The amount of volatile acidity is also very high in these two wines, and it is higher than it should be in all cases except No. 6 (red) and No. 9 (port).

In the second place, the percentage of unfermented sugar present is very high, indicating that the fermentation has not in all cases been complete. This may result in a further fermentation setting in, and may necessitate the addition of alcohol to prevent this fermentation. The quantity of sugar present in No. 1, No. 2, No. 4 (white wines), and No. 5 (red) is too high to ensure their keeping satisfactorily. Of the 1912 wines, No. 3 (white) and No. 6 (red) have been fortified.

The most satisfactory samples are the sherries. These are of the dry type, but even with these the volatile acidity is high.

On the whole, the information afforded by the analysis of this batch goes to show that the original juice was of good quality, but that the fermentation of the must has not been under proper control, and that too high a

TABLE I. - ANALYSES OF SAMPLES OF NEW SOUTH WALES WINES.—SERIES I.

Name of Wine	Specific Gravity of Wine.	Absolute Alcohol per cent. by volume.	Percentage of Proof Spirit.	Total Acidity as Tartaric.	Fixed Acidity as Tartaric.	Volatile Acidity as Acetic.	Extract.	Ash.	Sugar.	Polarimeter Reading.	Tannin.	Total Tartaric Acid.	Potash as Bitartrate.	Remarks.
										° ′				
1. White, 1912 ...	1·0066	13·52	23·70	1·025	0·58	0·356	6·76	0·226	2·61	...	0·014	0·226	0·208	Mannite present.
2. White, 1912 ...	1·0008	15·40	27·00	0·75	0·495	0·204	5·62	0·211	2·50	...	0·003	0·178	0·155	
3. White, 1912 ...	0·9850	18·68	32·73	0·585	0·39	0·156	2·35	0·157	0·017	...	traces.	0·166	0·125	Fortified.
4. White, 1912 ...	1·0009	15·12	26·49	0·56	0·36	0·160	5·79	0·205	2·87	...	0·001	0·220	0·160	
5. Red, 1912 ...	1·0105	15·30	26·82	1·09	0·64	0·360	7·60	0·350	2·77	...	0·122	0·184	0·166	Mannite present.
6. Red, 1912 ...	1·0028	18·48	32·38	0·56	0·40	0·13	6·49	0·267	3·29	...	0·074	...	0·151	Fortified.
7. Port	1·0171	18·36	32·19	0·56	0·36	0·16	10·17	0·248	7·26	−4 50	0·028	0·094	0·199	,,
8. Port	1·0175	16·70	29·27	0·79	0·45	0·27	9·86	0·285	6·37	−4 2	0·064	0·142	0·160	,,
9. Port	1·0293	17·70	31·03	0·57	0·46	0·088	13·18	0·257	10·40	−2 40	0·068	0·190	0·178	,,
10. Madeira ...	1·0171	17·81	31·22	0·67	0·48	0·152	10·04	0·202	7·28	−5 46	0·004	0·214	0·160	,,
11. Sherry... ...	0·9889	18·88	33·08	0·66	0·35	0·248	3·03	0·174	0·66	−0 38	0·002	0·178	0·160	,,
12. Sherry... ...	0·9856	20·15	35·31	0·69	0·36	0·264	2·66	0·177	0·17	..	0·002	0·166	0·110	,,

temperature has been allowed to develop; and further, that the fermentation has not in all cases been complete, leaving a residuum of unchanged sugar which is liable to undergo further fermentation and spoil the wine. To prevent this, the addition of alcohol is necessitated, which is undesirable and should not be required.

Series II.

Table II gives analyses of three samples of wines submitted by another New South Wales vigneron. The three samples are good specimens of Australian wine of good quality, and compare favourably with wines on any other market.

The Madeira is an especially good wine of the dry type. The Hermitage contains rather much tannin, which imparts an astringent taste to the wine. The Riesling is rather thin and lacks body.

The analysis shows that in the case of the Hermitage the fixed acids are rather low. This, taken in conjunction with the high tannin content and the high ash (exceptionally high for a wine of this kind), indicates that it might be advisable to add tartaric acid to the must before fermentation, instead of tannin, which appears to have been added. The addition of tartaric acid would have thrown down some of the potash, and made the wine clearer in appearance, and fresher in taste. It is suggested that about one part of tartaric acid per thousand (1 lb. tartaric acid to 100 gallons of wine) be added to the Hermitage wine 4 or 5 days before the next racking. This should give a clearer wine and increase its keeping qualities.

The volatile acids are in all cases very low. They are a little higher in the Madeira, but not to an objectionable extent.

The wines have all been well fermented, and the amount of unfermented sugar is negligible. The small quantity present in the Madeira rather improves the flavour.

Table II.—Analyses of Samples of New South Wales Wines.—Series II.

	Riesling, 1912.	Hermitage, 1912.	Madeira, 1912.
Specific gravity	0·9903	0·9931	0·9898
Absolute alcohol per cent. by volume ..	12·13	13·05	13·90
Percentage proof spirit...	21·27	22·88	24·36
Total acids as tartaric	0·63	0·50	0·70
Fixed acids as tartaric	0·55	0·38	0·53
Volatile acids as acetic	0·06	0·096	0·136
Extract	2·04	2·90	2·64
Ash	0·174	0·346	0·225
Sugar	0·12	0·08	0·204
Tannin	0·009	0·144	0·011
Tartaric acid, total	0·337	0·214	0·232
Potash, as bitartrate	0·260	0·220	0·245
Tartaric acid, free	0·129	0·040	0·036

SERIES III.

The four following samples are all of the dry light type. They appear in excellent condition, clear, with a clean taste.

The analyses show that the amount of fixed acids is higher than that of the average of the local wines of similar nature. The quantity is not, however, sufficient to impair the taste, and it protects the wines from alteration and the effects of excessive maturity.

The amount of volatile acids is low, and as the percentage of alcohol in three out of the four samples is not very high, this speaks strongly in favour of the good keeping quality of these wines. The fermentation has been in all cases complete; there is practically no sugar left undecomposed.

From the analyses it appears that the proportion of extractive matter is above the average; and more important still, the amount of ash is high, particularly in the red wines. This high ash, which is exceptional, undoubtedly increases the dietetic value of these wines.

The analyses go to show also that there is no scarcity in this State of raw material for the making of good first-class wines.

PROPOSED VISIT OF MR. H. W. CAMPBELL.

THE International Harvester Company has intimated to the Minister of Agriculture that a course of lectures by Mr. H. W. Campbell, the "father of dry farming," may be arranged for Australia, and has asked whether such lectures would attract general interest.

Mr. Campbell has certainly given a great impetus to the cultivation of lands in the dry regions of America. His system, based upon the principles laid down centuries ago by Jethro Tull in England, consists mainly of good cultivation to conserve moisture, and fallowing for a season to carry over as much as possible of one year's rainfall to the next, which is the cropping year. An implement, known as the "sub-surface packer," is used to compress the soil at the bottom of the plough furrow, whilst leaving the surface loose. Mr. Campbell has published a "Manual of Soil Culture," explaining his methods.

Although Mr. Campbell's methods have not been entirely successful here, we have learnt a good deal from his teaching of clean cultivation and conservation of moisture. The Minister of Agriculture has therefore directed that, should the proposed visit eventuate, the Department should give Mr. Campbell every possible assistance in arranging lectures and visiting experiment farms and branches of the Agricultural Bureau.

TABLE III.—ANALYSES OF SAMPLES OF NEW SOUTH WALES WINES. SERIES III.

Names of Wine.	Specific Gravity of Wine.	Absolute Alcohol per cent. by volume.	Percentage of Proof Spirit.	Total Acids as Tartaric Acid.	Fixed Acids as Tartaric Acid.	Volatile Acids as Acetic Acids.	Extract.	Ash.	Sugar.	Tannin.	Potash as Bitartrate.	Total Tartaric Acid.	Tartaric Acid Free.
1910. White Shiraz ...	0·9918	11·87	20·81	0·86	0·76	0·084	2·53	0·228	traces	0·003	0·264	0·333	0·138
1907. Riesling	0·9986	15·12	26·49	0·87	0·73	0·115	2·69	0·218	0·11	0·004	0·20	0·293	0·250
1907. Cabernet	0·9933	12·22	21·42	0·69	0·54	0·12	2·88	0·350	traces	0·064	0·174	0·150	0·027
1908. G. Verdot	0·9946	11·08	19·42	0·68	0·58	0·08	2·99	0·315	traces	0·101	0·208	0·210	0·06

The Vine in Australia.

[Continued from Vol. XXIII, page 974.]

M. BLUNNO, Viticultural Expert.

PLANTING A VINEYARD.

A VINEYARD is always planted with either cuttings or rootlings. Grape seeds are never used for the purpose because of two very great inconveniences —first, a seedling does not bear grapes till the plant is 7 or 8 years old; second, vines from seeds never reproduce the variety from which the seed was obtained, therefore the vineyard would be composed of many different kinds, every seed originating a vine different from the next. Furthermore, the great majority of these seedlings are usually sterile plants, that is, they would not bear grapes.

Propagation by seeds, which is also called sexual propagation, is pursued only when it is intended to create new varieties. It is a tedious process, involving a long period of selection among the congeries of new kinds, the majority of which are worthless. True, seedling plants are longer lived and more vigorous, although European vines from seedlings have been found to be subject to fungoid diseases and are killed by phylloxera just the same as those grown from cuttings.

Vineyards have always been planted, never sown; the principle is even consecrated in biblical language, for "Noah planted the vine"; he did not *sow* the vine. Agamic propagation, that is, propagation by bud, is therefore the time-honoured and proper system to follow in planting a vineyard.

The planting of cuttings or rooted cuttings is nothing but propagation by bud. The cuttings may carry 8 or 10 buds, or may be reduced to a mere bit of cane carrying a single bud. Single buds are not used in planting an ordinary vineyard, because their chance of success in ordinarily prepared ground is small. They would have to be planted a couple of inches deep, and consequently they would quickly dry unless watered regularly, which is a long process where thousands of them have been put in. Single buds are usually put in specially prepared ground, in a bit of sandy or otherwise fine loam, making a sort of seed-bed for them; rootlings are thus obtained which are afterwards planted in the vineyard. It is a very roundabout way, involving labour and loss of time, but it is the system to follow when one has but a few vines of a certain variety and wants to raise as many rootlings as possible of that variety.

Many growers in forming a vineyard prefer to plant rootlings rather than cuttings. Rooted cuttings can be used in such cases, the vigneron striking them in a small nursery bed a year before planting the vineyard. Cuttings are generally used, however, and these, carefully planted in a well-prepared

soil, and provided the spring and summer are not altogether rainless or visited by frequent drying winds, will give satisfaction. It is not exceptional to see over 90 per cent. of them growing.

Handling Cuttings.

Cuttings may have different lengths, as they may be of various kinds. There is the plain cutting or slip, Fig. 1 (*a*), carrying 6 to 8 buds; the cutting which was severed from the old wood carrying the crown at the bottom end (*b*); and finally, there is the cutting carrying a bit of the old wood with it (*c*). Some vignerons prefer the third kind of cutting, for the reason that the bit of old wood acts as a protection, and prevents the cutting from drying. Cuttings once severed from the plant should be properly kept till the time comes for planting them, and if such care is exercised there would be no reason for using the third kind of cuttings. Phylloxera lays the winter egg under the crevices of the bark of the old wood; such cuttings are therefore apt to spread this disease per medium of the fragment of the old cane. Moreover, as sufficient roots strike from the young wood, this piece of old cane is superfluous, and in the course of time perishes and decays. There is therefore no advantage in having it. The canes from which cuttings are obtained should be short-jointed, well summered, healthy, with plump buds. Preferably they should be canes which have borne fruit. Intending planters in the old world select the cuttings when the vines have their crop on, marking the canes with the best show of fruit. However, it is now proved that all canes can give prolific plants.



Fig 1.—Several kinds of cuttings.

When cuttings are not planted straight away, they can be stored in an underground cellar for three or four weeks without danger of their getting dry, but if the period intervening between the pruning and the planting is longer, it will be necessary to lay them in sand or fine soil in a place protected from wind and sun.

Shipping Cuttings.

When cuttings or rootlings are despatched to some other part of the country, or to another country altogether, great attention must be paid to their packing.

For short distances, involving a journey of ten days or a fortnight, the bundles are protected by a layer of straw lightly moistened with water, and the whole is wrapped in hessian. When the distance is greater, the cuttings or rootlings are placed in wooden cases with a mixture of sawdust and mountain or sphagnum moss, or, better still, of sea-grass Sometimes fine soil is used, which is good for small parcels, but makes big parcels very heavy. Bundles should be fastened with copper wire; twine or even galvanised zinc wire is apt to rot, and if the box contains different kinds there will be confusion and mixing of varieties. To every bundle a wooden label is tied; the label is smeared on one side with white lead, and the name of the kind is written on that side with indelible pencil. A fairly thick layer of the packing material, must be placed round the sides, also at the top and bottom, and then the interstices between the cuttings are filled with it. People who send away cuttings for the first time are usually over-anxious about the risk of the cuttings drying up; therefore they exceed in the precaution, and wet the packing material excessively, which need only be damp. Others go to extraordinary trouble, and stick sealing-wax on the top and bottom end of each cutting, or else char both ends. In any case, it is essential that the boards of the box be well knitted together, so as to have almost an air-tight case. Some nurserymen go to the extent of placing the cuttings in a zinc air-tight case, which is then slipped in a wooden case. For the last three years I have received vine-cuttings from various European countries—Italy, France, Spain, Portugal and Greece—which were variously packed. The cuttings from Greece arrived in the best condition, and they were wrapped in newspapers; but in this case the whole length of the canes, about three yards long, had been sent, just as they had been pruned off, and were put in a very long flat box, quite air-tight. Of course all were shipped in cold store.

When cuttings are sent to or received from countries on the other side of the equator, it is much the safest course, and it pays, to let the cuttings or rootlings travel in the refrigerated stores with which all modern steamers are now supplied. A temperature from 32 degrees to 38 degrees F. is suitable, although cuttings and rootlings will stand a much lower temperature than freezing-point. I have received cuttings that had not been put in the cold store of the ship, and the buds of many of them had burst, while others arrived otherwise damaged.

The latest date that vines can be shipped from Europe is March, which is there the end of winter; therefore they would arrive here within the first half of May. If the weather be too warm yet, the vines are laid in sand under a shed, or, better still, in a cellar. They are unpacked, sorted, and trimmed—that is, they are cut into lengths, or a fresh cut is made at the bottom fairly close to the bud, and at the top, allowing always a couple of inches of the joint above the top bud. The bundles are put upright, standing on a layer of sand. Sand is also dropped so as to fill the interstices between the cuttings, sand again being heaped up all round the sides. Water is sprinkled with a can on the top and on the sides, and again from time to time if the sand gets too dry. Thus they can remain till planting time comes, but if, on their arrival in May, fairly cold weather has set in, or at least if the nights are cold, the cuttings or rootlings can be planted straight away.

Length of Cuttings.

The length of cuttings varies from a few inches to 24 inches, or more. In the cold districts of Europe, near the northern boundary of the zone of the vine, vines are planted very shallow, from 6 to 8 inches deep. There it is necessary to have the roots close to the surface where they get the benefit of the sun's heat. In the vine-growing districts of Southern Europe the planting is generally far deeper, because it is thought that within the lower layers of the soil the roots will find moisture, and a moderate temperature for their better development. In some of these districts the length of cuttings is several feet, but then it is not on account of either heat or moisture, but because the soil within the first two or three feet from the surface is unsuitable for plant life, and it is only at a certain depth that good soil is found in which the bottom of the cuttings can strike roots. These, however, are exceptional cases.

Depth of Planting.

Many old practices have gradually been superseded in the light of modern experience, and the very deep planting once in favour in the warmer districts of Europe has been abandoned by the up-to-date growers. It has been shown that the vines planted shallow will penetrate the soil and reach the depth where they will find moisture and suitable heat. If a too deeply planted vine is lifted from the ground, it will always be seen that the roots closer to the surface are the longest and strongest, and that their size decreases with the greater depth (Fig. 2).

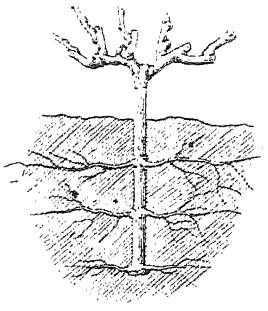


Fig. 2.—Vine planted too deeply.

The depth of planting that may generally be adopted in New South Wales is from 14 to 15 inches, for which a cutting of about 18 to 20 inches is required. Very deep planting,

even in warm climates, according to well conducted experiments, has a detrimental effect; vines then begin to bear later, and the crop is smaller and of inferior quality.

Disinfection of Cuttings.

When cuttings, and more so rootlings, are obtained from another country, or from a district which is either Phylloxera-infested, or close to one, it is an indispensable precaution to disinfect them. The most reliable method now known is to dip them in a solution prepared on the following formula :—

Potassium sulpho-carbonate, 32° Beaumé ...	3 gallons
Soft soap	10 lb.
Water	100 gallons.

Before dipping, it is advisable to keep them for five or six hours in plain water, in order to clean them of the soil that may be sticking to the roots and preventing the solution from coming in contact with the roots. It will also allow the tissues to absorb a certain quantity of water, as otherwise they would absorb the solution with detrimental effect.

The cuttings, or rootlings, are kept in the solution for 12 hours, and afterwards rinsed with plain water.

Roads in the Vineyard.

Before proceeding to the actual planting, roads are marked. Roads are indispensable for the carting-off of grapes, and of the canes dropped in the pruning; as well as for carting in manures, tubs with spraying mixtures, sulphur, stakes, &c.

In model vineyards roads occupy one-tenth of the area of the plantation. On flat ground roads are straight, and meet at right angles; in hilly country they, necessarily, are more or less winding, to get a convenient grade. The main roads are at least 15 feet wide, to allow space for two carts; the secondary roads are at least 7 feet, to allow room for one cart.

Distance between the Vines.

How far apart vines must be planted is one of the principal questions that any intending planter would ask of an expert, to which the expert replies: "It all depends." It depends on the climate, fertility of the soil, and natural vigour of the kind of vine to be planted. In fairly cold climates vines are planted closely, so as to have smaller vines, with their root systems nearer the surface, and with a limited number of branches and limited foliage, so that the fruit is not shaded by the leaves and gets the full benefit of the sun. In warmer climates, with a rainfall of 28 inches or more, vines are apt to grow very vigorously, and it would be a mistake to plant them closely, because the vines would shade one another to the detriment of the fruit. Here a suitable distance is 7 feet each way, or 6 feet in the row and 8 feet between the rows. Again, in warmer and dry countries, where the rainfall is 22 inches or less, and vines do not usually attain very large size, the distance must be increased, and the plants are put

8 feet apart, or 7 feet apart in the row and 9 feet between the rows. At the State Viticultural Station, Howlong, Riverina, in a fairly stiff, and in places very stiff clay, with an average yearly rainfall of 22 inches, two-thirds of which falls during the autumn and winter months, vines are planted 8 feet apart in the row and 10 feet between the rows, thus making 535 plants to an acre. The crop varies from 2 to 4 tons and over, according to the kind of vines, which may be naturally more or less prolific, and according to the kind of phylloxera-resistant stocks on which any variety is grafted. The lower yield is still a large crop, much over the average of the district, where vines are generally planted more closely than at the Government institution mentioned. This will show that it is a fallacy to believe that the larger number of vines per acre will give a larger output. In a relatively dry country the number of vines per acre must be smaller, because otherwise they could not get from the soil the indispensable quantity of water, of which they require a large amount, as the loss by transpiration in a warm and dry climate is much greater than in a country less warm, with a greater rainfall and higher relative humidity in the air.

If one judged *a priori*, he would say that in a poor soil fewer vines per acre should be planted, and that *vice versâ* a greater number should be planted in richer ground; yet the reverse is the case, for in a poor soil vines, even if very wide apart, will never attain a very great vigour, though they may be long-lived if properly tended. In fertile land, or land heavily and regularly manured, the distance between vines is increased and a larger crop is obtained than with a greater number of vines per acre, provided such a system of pruning is adopted as will give the vines the opportunity to materialise into a large crop their exuberant vigour, which otherwise would display itself in an extraordinary growth of wood and leaves. At the above-mentioned Viticultural Station the soil is a fairly rich clay. The vines are trained on the Guyot system, and I noticed that the crop, which was an extraordinarily heavy one the first two or three years that followed the graft, rapidly fell off after that, although the growth of canes and leaves was a very luxuriant one. I then applied the double Guyot system—that is, leaving two bearing canes instead of one, and in cases of vines of extra powerful growth, I left three and even four long canes, each carrying six to eight buds. Thus I changed the surplus vegetative vigour into physiological strength, which was exhibited by a larger crop of grapes.

Time of Planting.

In warm countries where most of the rain falls in autumn and in winter, vines may be planted any time during these two seasons, but where winters are relatively dry, or where the spring is long and visited by frequent rains, the planting may be successfully postponed till the end of winter or beginning of spring. In this State early planting is best, June and July being the best months. Truly, I was very successful once in planting 17 acres of vines, unavoidably, as late as November. They were the first lot of phylloxera-resistant mother stocks, grafted vines and non-grafted "check"

vines, planted at the Viticultural Station, Howlong; but extraordinary precautions were taken involving much labour, such as filling with sand the holes in which they were planted, mulching and regularly watering them. The success of this plantation, however, should not be sufficient reason for doing the same thing again, for against this there are many other instances in which delay in planting till warm weather had set in meant failure of many plants.

The success of a plantation depends on the readiness with which cuttings strike roots, or rootlings grow fresh roots from the existings ones. The striking of roots is dependent on the temperature of the soil, because, as I stated in one of the preceding articles, any function, vegetative or physiological, can only be fulfilled within a certain range of temperatures. The emission of roots takes place at about the same minimum temperature as that required by the buds to break forth into leaves, that is 50° to 52° F. The air gets warmer sooner than the soil, and this is why one sees the slips of a plant shooting before the appearance of any sign of roots. As the soil too gets warmer, so the cambium tissues become active and roots come forth. It follows, therefore, that vines strike sooner in some soils than in some others. Soils which are colder, either because of their unfavourable lie, or on account of their colour or texture, or because they retain an excessive amount of moisture, are those in which vines strike with greater difficulty. It may be noticed that with the advent of spring, and as the nights are no longer wintry, vines begin to shoot, and the shoots rapidly attain a length of 6 or 8 inches, or even more. Then they come to a standstill. This is when the substance stored up in the cuttings is exhausted, and the further growth must be supported by the roots, taking from the soil the necessary plant-food. The shoots on the cuttings do not lengthen or grow thicker till the roots are properly formed and their tissues quite differentiated, which is sometimes late in the spring and often well forward in the summer. Up till then, the shoots and leaves get their water up through the cutting by capillarity, but no assimilation whatever goes on in the leaves, which have not yet attained the size when chlorophyll initiates its function. An analysis of those shoots at that stage will show that they contain but traces of plant-food.

Treatment of Cuttings before Planting.

The shorter the period between the buds shooting and the roots striking the larger the number of cuttings that will grow, and it is on this principle that several devices have been evolved to enhance and hasten the emission of roots by the cutting. All these devices consist in removing the outer bark at the bottom of the cutting so as to uncover the inner bark or cambium, which is that thin, green, circular layer visible between the wood and the outer bark. To do this, shallow notches are made here and there over the last 6 or 8 inches of the cutting, or the cutting is rubbed over a sort of steel comb, say curry-comb, thus scarifying the bark of the last 6 or 8 inches, which is a much quicker process; or again, the bottom end of the cutting is

taken in both hands and lightly twisted till the wood is heard cracking. It is also advisable to remove the buds over the bottom half of the cutting, which, however, involves much time when thousands of cuttings have to be dealt with. It is erroneous to believe that roots strike off from the buds only. Buds have nothing to do with the origin of roots, which emanate only from the cambium or inner bark, and, therefore, may strike from any point of the portion of the cutting which is underground.

Systems of Planting.

Vines can be planted the same distance each way, thus having them in a square, or the distance between the plants in the row may be smaller than that between the rows, and we have them in a rectangle. They may also be planted so as to form a quincunx. Where vines are planted square the ground is better utilised, for the roots have then an equal distance on every

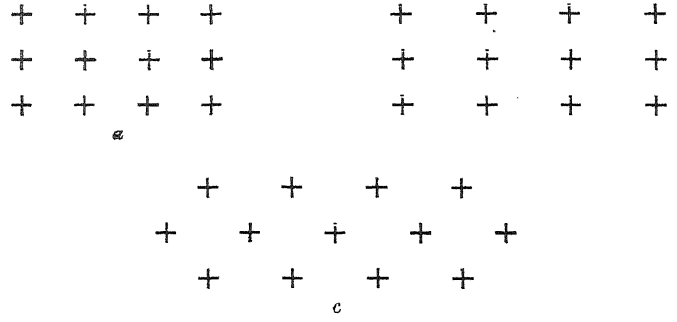


Fig. 3.—Systems of planting.
a square; *b*, rectangular; *c*, quincunx.

side in which they can run, but the disposition in a rectangle or in quincunx is also suitable, provided the difference between the distances in the row and between the rows is not very great. One or two feet difference will not matter. It might be said that perhaps I subtilise too much, and it might be pointed out that roots will run and expand wherever they find room, to which I might reply that it is desirable that roots should grow evenly round the stem, like spokes in a wheel, so as to have a plant well balanced, not a lopsided root system. In some districts of Europe the distance between the rows is often three or four times that between the vines in the same row, but then the ground between the rows is utilised with various crops.

The quincunx system is a very suitable one. If the vines be trained after the gooseberry-bush fashion, it will allow of the ground being ploughed and cross-ploughed, harrowed, and scarified in three directions. Where winds blow hard and persistently, vines shelter one another better; and in sandy soils this disposition minimises the inconvenience of the sand being blown away.

I give now the number of vines that can be planted on 1 acre, planting in a square, according to the distance from plant to plant :—

Distance in Feet.	Number of Plants per Acre.	Distance in Feet.	Number of Plants per Acre.
5	1,742	9	537
6	1,201	10	435
7	889	11	360
8	680	12	302

Planting Out.

A garden line will mark the direction of the row. A narrow lath, of length equal to the distance required between the vines in the row, is carried along the line, and a peg is driven at the end of the lath, the peg thus indicating where the stem of the vine shall be, and so on till the end of the row is reached. The distance between the first and second row is then exactly measured, the line is drawn, and the pegging is proceeded with as in the first row. It is absolutely necessary to be very exact in marking the position of the pegs, and also in measuring the distance between the rows, because the neglect of a fraction of an inch here and there will surely in the end throw the vines out of line when looked at crossways.

Cuttings may be planted in a hole made with a crowbar or else in a large hole made with a spade; rootlings are necessarily planted in a hole made with a spade. When planting with a crowbar, the peg is removed, a hole is made in its place, and the cutting is slipped in. Sand is then dropped to fill the hole, or a thick liquid mixture made with ashes and stable manure followed by a gallon or so of water.

In fairly loose ground, or in ground that has been well trenched, or where planting is done early in winter and good falls of rain may be anticipated before hot weather sets in, this system, which is very expeditious, may be

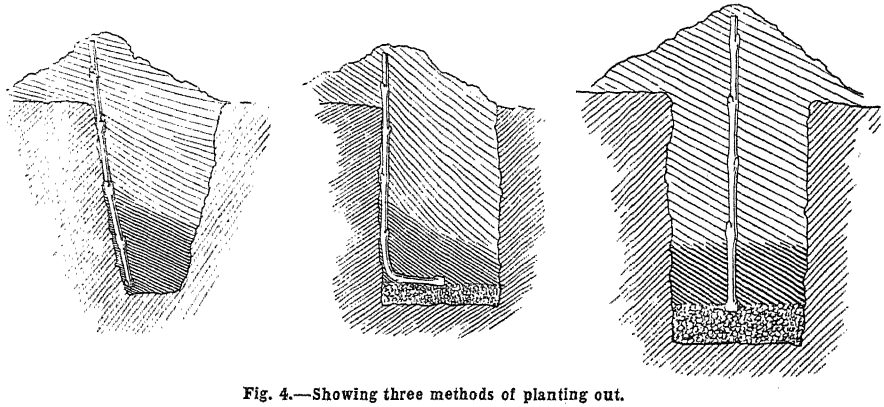


Fig. 4.—Showing three methods of planting out.

advantageously followed. Planting in holes dug out with a spade is a better way, although entailing more labour. It permits of the soil being well pressed round the bottom of the cuttings, which is indispensable to their easy striking.

There are two ways of planting on this system. One consists in leaving the peg and having one side of the hole flush with the peg. The peg is removed and the cutting placed in the small embrasure left by it; in this case the cutting rests against the relatively harder side of the hole. Again, the cutting or rootling may be placed in the centre of the hole. The peg then must be removed, and the alignment is lost if some device is not used to preserve it.

A simple and answerable device is the sighting-board, Fig. 5. Two of these are made out of a bit of lath. One is used by the man who digs the

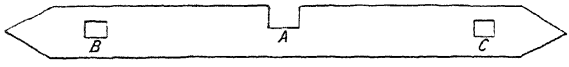
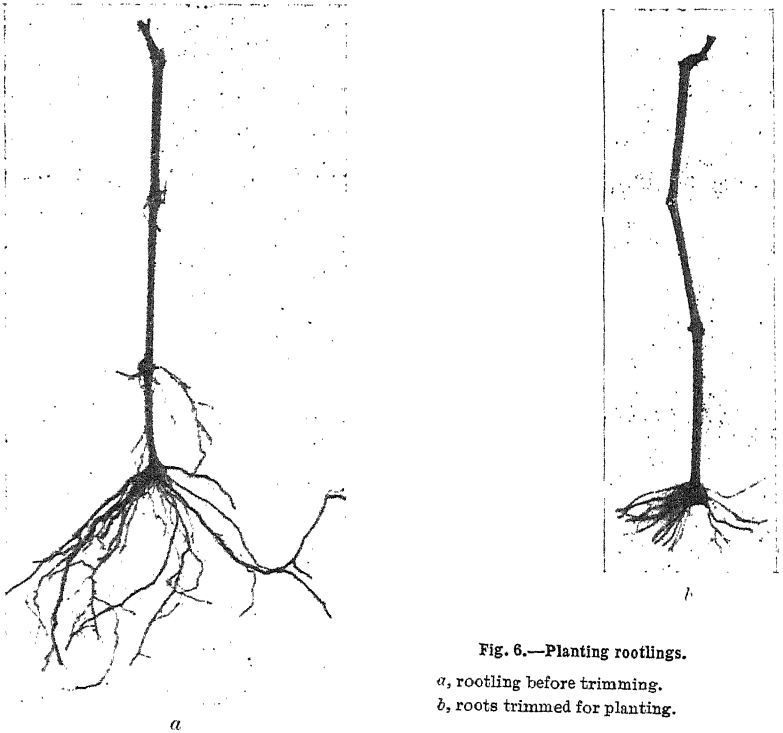


Fig. 5.—The sighting-board.

holes; he lays it on the ground so that the peg marking where the vine shall be is in the notch A. He then gets the two holes B and C in line



a *b*

Fig. 6.—Planting rootlings.

a, rootling before trimming.
b, roots trimmed for planting.

with the row by sighting through the two pointed ends of the board. This done, he drives two pegs in these holes, then he removes the board and peg A, and digs a hole where peg A was. The planter follows with another similar sighting-board, and places it so to have pegs B and C in the respective holes. The position A on the sighting-board indicates the point where the vine is to be planted.

When planting rootlings, all the roots that are bruised or decayed are cut off, the others being shortened to about 5 inches. The roots are spread at the bottom of the hole, resting on a layer of sand or of loose soil; another layer of sand is then put in and well pressed with the foot. Finally the hole is filled, and a small mound is made up to the crown. All the canes on the rootlings are cut clean off, barring one, which is cut back to two eyes.

A Destructive Root Mite.

The South Australian *Journal of Agriculture* reports that at Mount Barker the "bulb mite" (*Rhizoglyphus echinopus*) has been found in large numbers upon French beans. This is a very small semi-transparent mite, which attacks stored onions and bulbs, carrots, fruit-trees, and various roots and seedlings. The attacked surface appears to be covered with a greasy dust. When once attacked, the plant is nearly always doomed. In apple roots the bark softens and readily tears off, when swarms of mites are seen. Sulphur will prevent the mites attacking stored bulbs and cuttings, but once they have gained access to the roots, nothing economically practicable can be done against them.

LEASING OF GOVERNMENT STUD BULLS.

The Department of Agriculture is now in a position to be able to lease stud bulls for a period extending to twelve months, and the Minister of Agriculture has approved of the maximum term being extended from six months to twelve.

There are many advantages in favour of the new regulation from a farmer's point of view, provided his herd is sufficiently extensive to warrant his leasing a bull for twelve months.

The new regulation will save a good deal of transfers and re-engagements, and will thus be less expensive to farmers who require a bull for a term of more than six months.

The fee will be as formerly—£7 10s. for six months, and £15 for one year.

To the Members of the Agricultural Bureau of New South Wales.

GREETING.

On behalf of the experts, scientists and field officers of the Department of Agriculture, I would like to offer kindest seasonable greetings to the members of all the branches of the Agricultural Bureau of New South Wales.

During the past year twenty-three new branches have been started, making fifty-five in all. The members now number 1,900, and the educational work achieved has been considerable, as is amply shown by the reports and summaries published each month in the *Gazette*.

It has been found very difficult for the field staff and experts to visit each branch as often as we would all desire, but it is hoped at least to maintain the present average of two visits per annum to each branch.

May I suggest that it is indispensable that the meetings should be held regularly once a month, whatever befalls. Should no lecture or demonstration be available, why not select an article of local and seasonable interest from the *Agricultural Gazette*, which might be read and freely criticised and discussed, whereby great benefit will undoubtedly be gained.

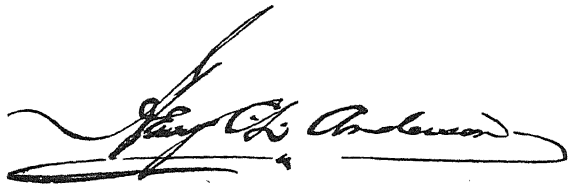
It is generally admitted that even these small beginnings of co-operation have been beneficial. Can you not combine together still further for mutual help in buying your manures, implements, twine, and other materials, in leasing stud animals, and in other ways that will suggest themselves to respective groups of members.

We hope to systematise the work during the coming year, and plan itineraries for our field officers and experts, so that they will be able to give a maximum of demonstration and educational help at a minimum expenditure of time and money.

Above all, do not neglect the half-yearly social meeting, whereby the wives and daughters and sweethearts may be interested in our objects, and the amenities of rural life increased.

The Minister and all the officers of this Department take a personal interest in this agency for good, and would send a New Year's Greeting by wishing every son of rustic toil

"Health and Peace and Sweet Content."



Under Secretary of Agriculture.

Sydney, 2nd January, 1913.

Agricultural Bureau of New South Wales.

Branch.	Honorary Secretary.
Albury	Mr. J. D. Lankester, Albury.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Beckom	Mr. S. Stinson, Beckom.
Bonville	Mr. H. B. Faviell, Bonville.
Bungalong	Mr. E. Hughes, Oakleigh, Cowra Road, *viâ* Cowra.
Cardiff	Mr. F. B. Cherry, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coreen-Burraja	Mr. H. Vickers, Coreen, *viâ* Corowa.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Derain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. Duffy, Henty.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Kareela	Mr. L. Haydon, Kareela.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit.
Kellyville	Mr. C. F. Boughton, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S Stening, Little Plain, *viâ* Inverell.
Lower Portland	Mr. G. Gosper, Lower Portland.
Mangrove Mountain ...	Mr. G. T. Hunt, Mangrove Mountain, *viâ* Gosford.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Moruya	Mr. P. Flynn, Moruya.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
New Italy	Mr. F. A. Morandini, New Italy.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose	Mr. L. Pieremont, "Vila," Penrose.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Spring Hill	Mr. J. A. Henry, Spring Hill.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Tallawang	Mr. J. E. Hansall, Tallawang.
Toronto	Mr. J. G. Desreaux, "Esmond," Toronto.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and Honorary Secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th, to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the Branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Samples of Wheat.

It has been decided to supply branches of the Agricultural Bureau with samples of grain and bunches of heads of the twenty-two varieties of wheat recommended by the Department for cultivation in various parts of the State. These comprise the leading varieties recommended for grain, hay, dual purposes, and green fodder. The collection should prove a valuable acquisition, especially for identification purposes, to members of branches in wheat-growing districts.

Secretaries intending to avail themselves of this offer are requested to make early application to the Department.

Lectures and Demonstrations by Departmental Officers in Course of Preparation.

Place.	Subject.
Albury	Lantern lecture on Fruit-culture.
Beckom	Wheat-growing.
Stockinbingal	,, ,,
Wolseley Park	Lecture on Sheep and Wool. Inspection of farmers' flocks.

NOTES AND REPORTS FROM BRANCHES.

Albury.

Mr. C. J. Sanderson, M.R.C.V.S., met the members of the above branch at Lavington at the end of November, and delivered a lecture to them on "Colic: its Causes and Remedies."

Balldale.

At the monthly meeting of the Balldale branch, on the 9th November, Mr. P. N. Howard read the following paper on "Co-operation":—

The spirit of the age appears to be for every body of workers to co-operate for mutual advantage and protection. All trades (as we well know) are now reaping the benefits of co-operation in the way of increased wages. Millers, wheat-buyers, woolbrokers, fertilising companies, insurance companies, bankers, &c., all have their associations, so that everywhere the farmer seems to be up against some organisation or another.

It appears to me that the last to absolutely realise their position are the farmers, and every way they turn leads to a dead-end. In several districts farmers' co-operative associations have been started, and in every case where the farmers have remained loyal and supported their associations good results have been achieved. This can only be done by the majority of farmers (never mind in how small a way) joining the local associations, and allowing the officers in charge a fair trial and not withdrawing their support immediately some firm tries to undersell their own association.

Some farmers lose sight of the fact that immediately their association is out of the way they are again at the mercy of the combines. I feel sure, if all the different farmers (and the co-operative barrow is big enough to hold every farmer in the State) pull together and order all their requirements through the local association, in a very short time the different firms would be competing for their business, and consequently farmers will enjoy the benefits of keen competition and large returns. We must not lose sight of the fact that the producers are the mainstay of the country, and if they present a solid front nothing can withstand them.

The present system of co-operation is the most economical ever introduced for the benefit of the farming community in the State—there are no principals in a co-operative association, and all profits are returned to the shareholders on an equal basis.

The object of a co-operative association is to handle all produce and purchased commodities without the intervention of the middlemen, but this is where the individual farmer is handicapped. He is like a poor little hopeless orphan in a cruel world, and can do little for lack of strength. A State-wide association would have sufficient force to carry on by its own internal strength, and could command the situation.

First, let me point out that farmers must not run away with the idea that they will, by dealing with a co-operative association, get goods at cost price, or that an association can allow them unlimited credit for indefinite periods. A co-operative association is a commercial concern, and as such must derive some profit to meet the necessary expenses of purchase and distribution. Still, the point I wish to emphasise is that any profit made over and above the actual expenses of management will be the property of the members, and as such must be divided *pro rata* from the business to each shareholder.

All will admit that the larger the business the better the terms on which it can be conducted; therefore, every farmer should be a shareholder. Most of the farmers seem afraid to put down a £5 note apiece to form an association, because it seems to place the sum at some slight risk. They appear to prefer to suffer a straight-out loss of £5 or £10 on the cost of each implement they have to purchase at inflated prices.

I might state here that the South Australian Farmers' Co-operative Association has now been in force for twenty-three years, and is doing a splendid business, showing large profits. This association started on the small capital of £228, which has developed at the present time to £250,000, and is still increasing. It owns thirteen ships, also the largest wool-store in Adelaide, where it disposes of its own wool by its own auctioneers. This organisation buys large quantities of cornsacks each year, also a lot of woolpacks.

On the North Coast, the Coastal Farmers' Co-operative Society has just been in force three years. This started with a very few shareholders, and the increase in the three years is from £800,000 to £1,500,000 for the year.

The Canterbury Farmers' Co-operative Company in New Zealand has been running for twenty years, and does a very large business, with splendid profits.

The Victorian Producers' Co-operative Company has also been in force only a few years, and is growing every year and doing a tip-top business.

In England, the English association started on a very small capital over fifty-five years ago, and now has developed into the largest society in the world. Its yearly turnover is £105,000,000, and the nice little profit of £12,000,000 is divided amongst the shareholders.

I could quote several others, but I think you will agree with me that the above show us very decisively what can be done by co-operation.

I feel sure in a district like ours that there is plenty of scope for a co-operative association. It only requires the farmers to pull together, and in a very short time they will find that they would command and get the protection which, by their position on the land, they are justly entitled to.

In conclusion, I would like to say that a company starting now is not like it used to be, as the Companies Act provides against all fraud, and when a limited liability company is promoted shareholders are only liable for the amount of the shares each takes up.

A hearty vote of thanks was accorded Mr. Howard for his contribution.

Carlingford.

A lecture was delivered by Mr. Henry Lord to members of the Carlingford branch of the Bureau at the November meeting.

Mr. Lord dealt with the composition of plants as shown by chemical analysis, with a view to ascertaining their requirements in the way of plant-food, of the soil in which they were grown, and the necessity of supplementing by the aid of artificial manures the deficiencies thus found. The essentials of soil fertility were nitrogen, phosphoric acid, potash, and lime. The first-mentioned constituent was derived mainly from the air, and was fixed in the soil by the growth of leguminous crops. Most soils required the addition of lime, which should be applied by itself. Phosphoric acid and potash should be supplied wherever they were found to be lacking in the soil.

The special requirements of certain crops were pointed out, notably tobacco and asparagus, the former requiring a soil rich in phosphoric acid, potash, and magnesia, and the latter one containing much potash.

With the aid of a large number of diagrams used in his classes, Mr. Lord explained the results of various manurial experiments, the formation of different varieties of soil found in the State, the value of cow-testing, the principles of line-breeding in horses, cattle, and poultry, and dealt interestingly with a large number of allied subjects, which the limited time at his disposal prevented the lecturer from treating fully.

There was a good attendance of members and others.

Cardiff.

At the annual meeting of the above branch, office-bearers were elected for the coming year:—Chairman, Mr. E. Rowe; Vice-Chairman, Mr. G. Warren; Treasurer, Mr. R. Gibson; Secretary, Mr. T. B. Cherry.

Crudine.

Mr. J. W. Matthews, Sheep and Wool Expert, visited this branch on the 2nd November, and gave a lecture on "Merino Wool-growing."

At the request of members of the branch, the lecture, which was for the main part of a practical nature, was held at Pyramul in the evening, preceded in the afternoon by practical demonstrations with both sheep and wool. A fairly large and representative gathering of sheep-breeders and wool-growers generally, were present, and all of whom exhibited a keen interest in the proceedings.

The party met at the homestead of Mr. W. Price, and he provided a shearing-shed and sheep for demonstrational work. The sheep were there classed, and the most suitable strains selected for mating purposes, according to the type being dealt with and the main objective of the breeder. Instructions were also given on the best methods of preparing clips for market. In advocating that classing should not be overdone, it was strongly impressed upon those present that, to avoid this, greater attention should be given to classing and culling their sheep, in order that they might have represented in their flocks greater uniformity in respect to length, strength, and quality of wool.

At the lecture in the evening, the questions of stocking, and the best methods of management, were discussed at length, local conditions being taken fully into account. It was pointed out that while the district generally was favourable to the development of the Merino, before the proposition of growing Merino wool could be seriously considered, and the best results fully realised, it would be necessary to take fully into account at least three prime factors which combine to ensure success, especially under local conditions. These were enumerated in the following order:—(1) The selection of

the most suitable areas; (2) the establishment, improvement, and maintenance of the natural pastures; (3) systematic breeding and management. Expressed in as few words as possible, this meant that much of the country in its present state is unsuitable to Merino breeding. Merino wool cannot be grown to the best advantage on country which still remains in its natural state, and it was pointed out for consideration that, before Merino breeding could be undertaken with any reasonable prospects of success, much of the country would require to be denuded of the native bush. Good pastures must be established, and to secure this the country would require to be opened up, timber ringbarked, and the growth of all seedlings and suckers which appear on ringbarked country kept well in check. As regards stocking, it would be necessary to carefully consider the carrying capacity of the land. Overstocking should be avoided, as it is unprofitable, misleading, and dangerous. Perhaps the greatest drawback which the settler working under local conditions has to contend with is the invasion of the rabbit. The rabbit is the natural enemy of the sheep; it takes the best grasses, and in consequence only leaves the poorer and less nutritious herbages for the sheep Moreover, the grazing value of the country is very often considerably reduced, owing to the rabbit eating out and destroying many of the sweeter and richer plants. Experience has proved that it is a matter of almost impossibility to raise high-class Merino wool on country which is infested with rabbits. Rabbits are here to the detriment of the sheep, and it is absolutely necessary to get rid of them. After years of experience, combined with costly experimental work, the general consensus of opinion expressed by those who have given the question the attention that it deserves is to the effect that the most effective and permanent means of extermination consists of a subdivision of the area into smaller sections, by the erection of netting-proof fences, the picking up and burning of all fallen timber, and the digging out of all the warrens.

The period of mating, and the resultant time at which the lambs should be dropped, were also considered with due regard to season and local conditions. The late winter or very early spring lambing was recommended in preference to the lambing which takes place in the late spring. Although, perhaps, being rather severe on the ewe, the earlier the lambs are dropped the greater benefit they derive from the young grasses which are available during the spring months.

Gerringong.

A branch of the Agricultural Bureau has been formed at Gerringong. Mr. R. N. Makin, Inspector of Agriculture, addressed the meeting, and pointed out the advantages which the Bureau offers to the farming community.

The following office-bearers were elected for the ensuing year:—Chairman, Mr. A. Campbell; Vice-Chairman, Mr. W. J. Hindmarsh; Treasurer, Mr. D. F. Bailey; Secretary, Mr. J. Miller.

Gunning.

Mr. H. S. Major, Assistant Sheep and Wool Expert, visited the shearing sheds of four of the members of this branch while shearing was in progress on 7th and 8th November, 1912.

The country is mostly taken up for sheep-grazing. The flocks were all of the small-framed type, covered with very fine, short, dense wool, features in a great measure due to the climatic influences of the district. The sheep and wool showed little signs of the recent dry spell.

Mr. Major advised growers to make some departure from very fine quality, and to study commercial value rather than price per lb. He suggested that, instead of using very fine quality rams, plainer bodied and more robust woolled types be employed, with a view of obtaining increased length of staple. Suitable rams might be obtained from Tasmanian flocks, but he had seen very good results obtained by the judicious blending of the Wanganella strains with the finer woolled ewes. Care should be taken, however, not to select too coarse woolled rams, as there would likely be produced considerable variation in the quality of the wool. Mr. Major instanced that, during his experience in the Western district of Victoria, under similar conditions, excellent results had been obtained by the blending and breeding-in of these two strains. A farmer owning 5,000 sheep mated his ewes with the plainer-bodied Wanganella flock rams, carrying very

long medium quality wool of high character and soft handle. The surrounding growers foretold disaster, but results proved otherwise, as the first drop of lambs was bigger than any in the district, and the wool sold up to 20¼d. per lb. in the grease. As hoggets, these sheep surpassed any others in the vicinity for all-round commercial value.

Mr. Major also gave a practical demonstration on up-to-date packing of wool with the use of the four steel skewers. This method can be adopted in all presses where the monkey with cap attached is brought down to the stitching of the corners of the top of the woolpack. The skewers can be placed in position in one quarter the time it takes to sew the cap. With the new method the cap is not sewn at all, and only one double strand of twine is used for a bale, as against four double strands in the old method. The corners of the pack are not cut down, and no wool is visible after pressing. It is estimated that one hank of twine is saved in every ten bales packed by the new method.

He found the growers took great pride in their sheep and wool, and were on the right track as regards the preparation necessary before forwarding their wool to market.

Henty.

The summer pruning demonstration fixed for 3rd December, at Henty, had to be abandoned on account of heavy rain falling that day.

In the latter part of November, Mr. C. J. Sanderson, M.R.C.V.S., delivered a lecture to a representative audience. The subject was "Treatment of Foaling Mares."

Kareela.

A lecture on "Poultry" will be delivered to members of the Kareela Branch, by the Poultry Expert, Mr. G. Bradshaw, on 11th January.

Leech's Gully.

In answer to an inquiry from the secretary of the Leech's Gully Branch, *re* the destruction of pumpkin beetle, Mr. Froggatt, the Government Entomologist, advises the use of the same mixture that is used for cabbage moth. The mixture consists of 4 cwt. of lime and 1 cwt. of tobacco dust. The lime and tobacco are thoroughly mixed and dusted over the foliage and flowers in the early morning when the dew is on the plants.

Moruya.

A branch of the Bureau has been formed at Moruya. Office-bearers for the ensuing year are :—Mr. J. R. Milne, Chairman; Mr. Bede Heffernan, Vice-Chairman; Mr. H. E. Simpson, Treasurer; Mr. P. Flynn, Secretary.

A Committee was also formed of the following gentlemen :—Messrs. A. Keating, F. Flanagan, A. Southil, W. Ryan, L. Collet, P. Hoolahan, and A. L. Jeffery.

Mangrove Mountain.

Mr. M. Henry, M.R.C.V.S., delivered a lecture on "Ordinary Equine Ailments," under the auspices of this branch, on the 2nd December, at the residence of Mr. Tange.

The lecturer prefaced his remarks by pointing out that the subject was rather a wide one, and he had therefore selected the three commonest complaints from which stock were likely to suffer—colic, wounds, and lampas. Colic was dealt with fully, and the important connection between improper feeding and colic emphasised. In the treatment of wounds, the lecturer laid special stress on the need for cleanliness. With regard to lampas, it was pointed out that as a disease it was largely imaginary, and that a little rational treatment was successful in most cases. The brutal practice so frequently adopted of burning the gums with a hot iron was condemned.

New Italy.

A lecture on "Manures and Manuring" was delivered by Mr. G. Marks, Inspector of Agriculture, to members of this branch on the 15th October.

The lecturer said that to those engaged in agricultural or horticultural pursuits few subjects are of greater importance than that of manures and manuring. From a general knowledge of the nature and composition of plants we learn that they are living things; they require food for their growth and development, and their ash-forming constituents are obtained from its soil. The investigations of the chemist show us what ingredients the soil is made up of, how these ingredients exist—whether free or in combination with other materials—and how the plant's food is rendered available, compounded, and used. By exhaustive analyses it is found that the constituents do not exist in all soils alike, or in the same proportions; some exist in an available form, others in an unavailable form. In order that the best results may be obtained from cultivated plants, there must not only be a plentiful supply of the ingredients required by plants, but these must be in such a condition that plants are able to take them into their systems. Amongst other things, they must be in a state of solution. The amount and condition of plant-food in a soil determines its fertility. Soils containing a deficiency are termed very poor, poor, or fair; whilst those containing more and plenty are designated good, fertile, and very fertile, &c. By means of the various classes of farm implements, the soil is treated in such a manner that the most favourable conditions are promoted for moisture and air to enter, for nitrification and bacterial activity, which, together with the chemical changes and mechanical condition which the natural weathering agencies promote, have the effect of elaborating plant-food and placing in such a condition that it becomes available for plant use. All plants remove a certain amount of constituents from the soil, the amount depending upon the variety and weight of crop, the season, and other conditions. If none of these constituents are returned in some shape or form by the individual, or by the many natural agencies, there must be a steady diminution of these amounts until the soil is partially or completely exhausted; and its effect is at once noticeable in the cultivated crop. Soils of a shallow and poor nature are more readily exhausted than those that are deep and rich, and especially those of an alluvial formation and subject to periodical flooding.

The principal ingredients required by plants are phosphoric acid, potash, iron, lime, magnesia, soda, sulphuric and hydrochloric acid, nitrogen, and water. The water, carbohydrates and nitrogenous matter, are for the most part supplied by the air and rain (with the exception of nitrogen in some plants); they constitute the volatile portion of the plant and represent about 98 per cent. The balance, 2 per cent., is supplied by the soil. If from any reason the soil is unable to supply the demand, then they may be artificially supplied by means of fertiliser.

As a rule, the ingredients removed by crops in any quantity are potash, phosphoric acid, nitrogen, and lime. Lime is, however, not generally regarded as a manure—its functions are chiefly mechanical, to modify the physical character of the soil, and chemical in rendering available certain insoluble plant-foods; it is, of course, in addition, a direct plant-food. Manures are used to supply principally phosphoric acid, potash, and nitrogen.

The lecturer referred at length to the fertilisers in the market that supply the ingredients, and briefly outlined their nature, composition, and manufacture. Farmyard manure and green manure were next fully discussed.

Green manures, which consist of cultivated crops—for preference those of the leguminous class, such as cowpeas, fieldpeas, vetches, clovers, &c.—were specially recommended for renovating impoverished soils, and for restoring the humus supply, which is so essential for nitrification, bacterial activity, and maintaining the soil in good mechanical condition. On the North Coast, the cowpea for summer and the fieldpea or black vetch for autumn or winter would be found suitable. They work well in a crop rotation, can be used in conjunction with other crops as a stock-food if required, assist in keeping down weed-growth, and when the humus supply has been exhausted by the constant practice of continually burning off every form of vegetable matter, they really form one of the most economical and profitable crops to grow over extended areas.

The lecturer referred at length to the making up of mixtures of chemical fertilisers for various crops, methods of application, effect of wet and dry weather, cost, results of experiments, precautions to be observed in their purchase, storage, and use, losses or waste to guard against, top-dressings, liquid manures, irrigation, &c.

In conclusion, Mr. Marks stated that as so many outside agencies affect the growth of crops—such as elevation, climate, rainfall, aspect, prevailing winds, proximity of mountain ranges and sheltering forests—the only really effective method of proving which

manures are the best suited for each locality is by actual experiments on the spot, extended over a number of years. In this connection, the farmers' experiment plots are doing valuable work, and with the interest and sympathy of those living in the locality where they are established, they will prove of inestimable benefit, and amongst other matters give valuable information with regard to manures and manuring.

A hearty vote of thanks was accorded Mr. Marks for his instructive address.

Penrose.

The annual meeting of this branch was held in November. The President, Mr. Roberts, in his address to members, said :—

One year has passed since the establishment of the local branch of the Agricultural Bureau—a year that has been marked by steady growth in membership and influence, due to the unflagging and whole-hearted interest manifested by members, who have at all times shown an unselfish desire to sacrifice time and talents in every movement for the general good.

Cleverly-written papers, entailing much time and thought, have from time to time been submitted by different members, and the valuable information and useful hints thus imparted have been the means of levelling up the general knowledge of members in a remarkable manner; so much so that even your president now talks glibly of the difference between the habits of the elephant beetle and the spray-pump.

The Department of Agriculture has treated us generously in the matter of sending experts when asked for, and it is highly gratifying to note the keen interest manifested in the visits of these gentlemen, particularly in the frequent visits of Mr. Bryant, whose instruction is resulting in immense benefit to the whole community.

Early in the year a little co-operative movement in the shape of local distribution of spraying materials was successfully undertaken. Orchardists saw the advantages derivable from the system, and their minds were ready to seize upon co-operation in a bigger way. Hence, when the great forward movement of the year—the Fruitgrowers' Co-operative Association—was mooted, the movement went with a rush, and owing mainly to the generous support from this district, the Association is now fairly launched, the long-wished-for infant of co-operation has been born, and I look forward to the time when the infant will be a giant that will dominate justly and equitably the fruit markets of Australia.

Sackville.

The annual meeting of this branch was held on 25th October, when a fair attendance of members was present. The members were unanimously agreed that the contemplated conference of delegates at Easter would be productive of much good; they pledged themselves to assist in every way. Mr. R. Camerini, manager for Dr. Fiaschi, read an interesting paper on potato culture. A paper on potato-growing will be read by Mr. Tuckerman at the next meeting.

On the 22nd November Mr. Bradshaw read a paper on poultry-breeding, under the auspices of the local branch.

The chief points were to the end that the present demand, amounting almost to mania, for Leghorns was not justified, and if persisted in would lead to the annihilation of good table poultry. Mr. Bradshaw said it needed no demonstration from him to show that Leghorn cockerels were poor table fowls, which, at whatever age sold, showed a very poor return for their rearing. He did not suggest that those who keep Leghorn fowls should give them up, but rather that they should secure a breeding pen or two of Orpingtons, Langshans, Wyandottes, or other general purpose fowls as well. The pullets from these would be good layers, and the five or six months cockerels fetch up to 9s. per couple, an excellent paying price, even with the high current rates for food.

Sherwood.

On 23rd November, Mr. G. Marks, Inspector of Agriculture, delivered a lecture to members of this branch on "Maize and Ensilage," and in the course of the lecture said :—

The high prices that have been ruling for some months past will undoubtedly act as an incentive to many to devote more attention to the growth of maize. From a variety of causes there has, during the last ten years, been a noticeable falling off in the area allotted to maize. The expansion of the dairying industry and the lighter yields due to partial impoverishment of the land are largely responsible for this state of affairs, and as stocks of grain cannot be held for any length of time without deterioration, due to the depredations of weevil, it usually happens that the farmer has to dispose of the bulk of his crop as soon as it is harvested. The practice of cropping land continuously year after year with maize, without rotation, manuring, or resting of any kind, has had an unmistakable effect upon the maize yield, and this practice if persisted in must lead to more harmful results. Maize requires a deep rich soil ; it is a heavy feeder, and this necessitates due regard being paid to the thorough preparation of the soil before planting. The cultivator during growth should be systematically used, not only to keep down weed-growth but also to conserve moisture, which is a very important matter for the dry months that generally affect the early maize crops. Selection of the seed does not receive the attention that it deserves, and the results obtained from some of the farmers' experiment plots have amply demonstrated the importance of this work. In many instances growers plant too thick, being under the impression that each plant will have its cob or cobs, and the more plants obtained per acre the heavier the yield. While it is necessary to plant fairly thick on new virgin brush land, having a good rainfall, the same rule does not hold good on older lands, or in districts having a lighter rainfall, for unless there is sufficient moisture and plant-food for each plant, their yields of grain correspondingly suffer. Probably the most economical way to restore fertility to the impoverished maize lands would be by the growing of leguminous crops, such as cowpeas for the summer and fieldpeas or vetches for the winter. These could either be partly or completely fed-off by the dairy herd (and these crops, by the way, are valuable as milk-producing foods), or they may be ploughed under while green. This practice would greatly improve subsequent crops, though it would be unreasonable to expect to restore in one year or by one crop the fertility removed by, say, forty or fifty crops extending over as many years. The use of the combined husker and sheller has dispensed with a great deal of tedious hand work, and provided the cobs are dry it has the advantage of turning out a clean bright sample, practically free of all weevil. Numerous phases of the subject—such as the ploughing, preparation of the soil, selection of the seed, sowing, cultivating, harvesting, &c.—were enlarged upon by the lecturer, and special reference was made to the subject of manuring, either by the use of chemical fertilisers or green manuring.

Maize is specially valuable for ensilage. It is an easy crop to grow and harvest, and is capable of yielding from 20 to 30 tons of green fodder in our coastal districts. The heaviest yields are obtained from November and December plantings, when the late summer and early autumn rains favour a heavy green growth. It may be conserved in the tub, pit, or stack. The first-named method is preferable. For those of limited capital the stack can be utilised, though the chief objection to it is the large amount of waste. In the hilly districts the hillside silo can be recommended. The dairyman must devote more attention to the food supply for cattle, for the seasons do not permit of the pastures supplying succulent green feed all the year round ; and in addition to the cultivation of areas for green feed to supplement the pastures, special areas should be planted for silage that can be held in reserve for use when required. The lecturer briefly outlined the methods of making silage in the various forms, the amount of green fodder required, the best condition to harvest, precautions to be observed to avoid waste and failure, the various changes that take place during fermentation, and the feeding of silage to stock. The low returns obtained by hundreds of dairymen along the coast during the past winter and spring due to overstocking, dry weather, and natural shortage of feed, should make owners think ; and if a little more attention were paid to the culling of their herds, and cultivating portion of their farms to grow feed in season, and conserve larger quantities (not less than 100 tons) as silage, it would be found that many losses now sustained could be easily prevented. Numerous questions relating to the subject were answered before the meeting terminated.

St. Mary's.

Members of the above branch assembled on 27th November to hear Mr. Henry, M.R.C.V.S., deliver a lecture on "Treatment of Wounds and Colic."

Mr. Henry also gave a demonstration of a *post mortem* examination of a horse. The audience, a fairly large one, was keenly interested in the lecture as well as in the demonstration.

Toronto.

An enjoyable as well as educational trip was undertaken by members of the Toronto branch to Richmond, in order to inspect the Hawkesbury Agricultural College, on 18th November. The secretary reports that, especially to the younger members, the trip was of inestimable value.

Wetherill Park.

A branch has been formed at Wetherill Park. Office-bearers for the ensuing year are:—Chairman, Mr. A. H. Clarke; vice-chairman, Mr. H. C. Coggins; treasurer, Mr. P. C. Cotter; secretary, Mr. L. Rainbow.

"Parturition of Farm Animals" was the subject of an interesting lantern lecture, delivered by Mr. M. Henry, M.R.C.V.S., to members of the branch, on 28th November.

Wolseley Park.

At the November meeting of this branch, with an attendance of 34 members and 16 visitors, Mr. Harry Hoodless read the following paper on potato-growing:—

Soil and its Preparation.—The potato can be grown in almost any kind of soil in this district, although some soils, of course, are much better suited than others. Loose, red soil is the most suitable, as it is usually better drained; it is much easier to keep in good order, therefore produces tubers of better quality. Having an average rainfall of 32 inches, the crop seldom requires irrigation, provided it is well tilled.

Having selected the plot, it should be fallowed early in the winter, so that the soil will be exposed to the frost. Ploughing can scarcely be done too deep, providing none of the subsoil is brought to the surface.

Before planting (which is usually done in November and December), the ground should be cross-ploughed, and well harrowed, in order to get rid of all lumps, as ground for this crop cannot be too well tilled.

Selecting seed.—This is a very important item, unfortunately too often overlooked. A good crop cannot be expected from run-out and diseased seed; it should be changed about every three years, and if possible procured from a cooler climate.

Many different opinions exist as to which is the best method of planting, whole sets or cut tubers. I prefer the latter, as they are not so likely to perish with excessive wet or excessive dry weather. In cutting potatoes, it should be remembered that the number of eyes are not of as much importance as the size of the set. Two or three eyes are ample.

Varieties.—Potatoes that have proved suitable for this district are Brownell's Beauty, Up-to-date, and Satisfaction.

Planting.—This should be carefully done. The tubers should be placed cut-side downwards, and pressed well into the soil on the side of the furrow, so that the horse walking in the furrow may not disturb them. The sets should be placed from 14 to 18 inches apart in the row. The rows should be about 2 feet 6 inches apart, in order to allow working between with a horse.

Cultivation.—As soon as the young sprouts are visible above ground, cultivation should commence. This should be done shallow, and frequently, especially if the weather is dry. As soon as the young tubers begin to form they should be hilled up. This will prevent them breaking through to the surface, and thus being destroyed by sun and frosts.

The paper was then fully discussed. The following are the points upon which the discussion took place :—

1. *Preparation of the Soil before Planting.*—Mr. Jeff Downie asked which time of the year was considered the best to fallow for potatoes. Mr. Hoodless said it should be done early in winter, so that the turf would have sufficient time to decompose before the time came to again work the soil. Mr. T. McAuliffe thought the sooner the land could be fallowed the better ; even as early as the autumn was not too early, because the land required to be worked as fine as possible, and if the turf was well rotted the after cultivation would be much easier. He thought the land should be ploughed three times before planting.

Mr. J. Eisenhauer, jun., thought that the first ploughing should be very shallow, and the second as deep as possible.

The meeting favoured the autumn in preference to winter fallowing for potatoes.

2. *Selection of Seed and best time for such Operation.*—Mr. T. McAuliffe asked when is the best time to select seed potatoes.

Mr. T. Bagust said at time of digging, because the good potatoes could be more easily discerned then, and so kept separate from the bad ones. Mr. Hoodless thought the best time to select seed was just before planting, for then the best keepers could be judged.

Mr. T. Bagust said it was only natural to throw out the rotten potatoes, and bad keepers could be re-picked from seed selected at time of digging.

Mr. Garner thought a good time to cull out poor quality potatoes was when the crop was at the flowering stage. Potatoes, he said, had been brought up to the present standard by careful selection and culling. At one time they used to grow wild, and hence are always prone to revert back to their natural state. The flowers of the present marketable product and those of its wild antecedent differ, and if this difference was noted by the farmer he could go through that portion of his crop from which he intended to select his seed, and pull out any plants whose flowers were not true to type. This process should leave only the best potatoes, and one advantage, he thought, it would have over other methods of selection was that potatoes with a tendency to "revert back" or become "run out" could not always be distinguished from thrifty growers at any other time except at the flowering stage.

Mr. Bagust thought red-flowered potatoes were either useless or wild.

Mr. A. Evans said he had noticed that different varieties have different coloured flowers.

The question, "When is the best time to select seed potatoes?" was put before the meeting. The majority favoured the time of digging.

3. *Most Suitable Size of Seed.*—Mr. Bagust asked Mr. Hoodless what kind of seed he preferred, whether large or small?

Mr. Hoodless said he preferred large seed to small seed always, but he though a potato weighing about 2 ounces, or the size of a turkey's egg, with as few eyes as possible, the best for seed ; too many eyes were responsible for too many shoots.

Mr. Bagust : What about cut seed rotting when planted during a dry time?

Mr. Hoodless said rotting of cut seed could be prevented by dipping the sets in lime.

Mr. Nicholson said he had had experience in potato-growing in Scotland. Cut seed, he said, should lie in lime for three days before planting. This would prevent the seed from bleeding, and so preserve much of its vitality. He believed in seed about the size of an egg.

Mr. C. Hille (an old potato-grower in the district) favoured sound seed about the size of a hen's egg ; he did not approve of cut seed. It was responsible for too many misses if planted in dry soil, while sound seed was sure always.

Mr. Garner said the failure of many of the present-day crops was due to the selection of small seed year after year ; this caused the main crop to deteriorate in size. He believed in picking medium-sized, strong, healthy potatoes, and planting immediately after cutting.

Mr. Bagust thought that seed should be cut, for if too many eyes were left in a set too many stalks would be produced, and they would absorb much nourishment that should go to the tubers.

On the question of size being put to the meeting, the majority favoured seed about the size of a hen's egg.

4. *Best Kinds of Potatoes for the District.*—Messrs. T. McAuliffe and J. Eisenhauer favoured Brownell's Beauty. This potato they considered a good keeper, a good saleable sort which grows with a minimum rainfall.

Mr. A. Evans favoured Bliss' Triumph. He said that it is a good shaped potato with shallow eyes, even better than the Brownell's Beauty in this respect, which is a big advantage, because deep eyes necessitate the cutting away of a lot of the potato when being prepared for table purposes.

Mr. Joe McAuliffe favoured the Brownell. Mr. T. Bagust thought Bliss' Triumph was the best for the district; it is, he said, a hardy, good shaped, good saleable potato.

Mr. Hoodless favoured Bliss' Triump, Up-to-date, and Brownell's Beauty; all these varieties had proved satisfactory in the district.

5. *Distances between Rows and Sets.*—Mr. Hille said he was opposed to the idea that sowing small seed was responsible for failures, but would rather attribute the cause to close planting; he had seen potatoes planted as close as 6 inches between each set; he thought about 18 inches between each set and 30 inches between each row was a good profitable distance to plant.

Mr. H. Clegg said that if planted closer than 18 inches between each set and 2 feet 6 inches between each row, the result would be a poor weedy growth of both tops and tubers.

Mr. Hoodless thought the rows should not be less than 2 feet 6 inches apart; if any closer, cultivation between the rows would be difficult. He thought about 14 to 18 inches was a fair distance between each set. The distances, 2 feet 6 inches between each row and about 18 inches between each set seems to be adopted generally throughout the district.

6. *Depth of Planting.*—Mr. J. Eisenhauer thought 4 inches was the most satisfactory depth to plant, and on this point the meeting agreed.

7. *Method of Planting.*—Mr. A. E. Evans asked if it was not a good idea to plant on top of the ground along the edge of the open furrow, and then turn the seed into the furrow, under and with the next sod. This, he said, would minimise the number of misses, because when planted in the furrow the horses and plough-wheel always crushed a lot of seed.

Mr. Hoodless said that if the sets were pressed into the loose earth, in the furrow on the side away from the wheel, none would be damaged through the wheel passing over them, and even if a horse did tread on seed so placed it would not be damaged One objection he had to Mr. Evans' plan was that in cases where cut seed was used much difficulty would be experienced in keeping the cut-side downwards.

Mr. Evans wanted to know what objection Mr. Hoodless had to the cut surface of the seed being turned upwards.

Mr. Hoodless said if the cut-side was placed downwards the sprouting would be greatly assisted, especially when the land was dry at time of planting.

8. *Irrigation.*—Mr. T. McAuliffe asked in cases where a running stream of water was available, how many waterings for crop should suffice?

Mr. Hoodless said he thought once or twice was sufficient; much, he said, depended on the rainfall, but the most important time was when the crop had reached the flowering stage.

Rutherglen Bugs on Potatoes.

The Rutherglen bugs suck up the sap with their beaks, and, where numerous, soon cause the plants to shrivel. They are difficult to destroy by a contact spray.

The best method of ridding the plants of them is to use a shallow dish or iron tray containing a mixture of water and kerosene, and draw this along between the plants. Someone should follow behind, and with an old broom or piece of brush, beat the foliage on either side as the tray of oil passes. If this is done in the early morning or in the dusk, thousands of the bugs are brushed or fall into the oil and are destroyed.

Another good method is to draw a screen between the rows, having previously covered it with tar. The same procedure of beating the plants should be gone through. In this case the insects fly against the screen and are caught.

It is necessary to repeat these operations several mornings running, or while the bugs appear.—A. J. Pinn.

Success of the Government-bred Bull, "Sir Jack."

M. A. O'CALLAGHAN.

When Mr. O'Meara paid 170 guineas for the Jersey bull "Sir Jack," at the Sydney Show sales in 1910, the price was considered to be an extreme one for a bull which was rising 6 years of age, but his record since that date goes to show that the price paid was not too high, provided the animal could be suitably mated.

When Mr. O'Meara sold out all his Jersey stock recently, the Jersey bull "Sir Jack" was secured by Mr. O. H. Gollan, of Woodburn, at something less than 70 guineas, and, though "Sir Jack" is now over 8 years, he must be considered a bargain by Mr. Gollan, because he has not done anything like the same amount of work as the ordinary 8-year-old bull.

For the first five and a half years of his life he was at the Experiment Farm at Berry, and as the number of Jersey cows kept there is very small, "Sir Jack" might be said to have done very little active service until passing into Mr. O'Meara's hands when nearly 6 years old.

"Sir Jack's" heifers are now milking at the Berry Experiment Farm, and both in appearance and in productive capacity they are all that one could desire.

"Sir Jack's" Show Career.

As the Government does not compete at stock exhibitions, needless to say "Sir Jack" was never exhibited in competition prior to his sale, but many who saw him in the non-competitive classes at the Sydney Shows declare that he was worthy of champion honours. Later on, however, Show judges had an opportunity of saying what they thought about this bull in competition, and there seems to be but one opinion, namely, that he is among the best of his breed that has been seen in this country. In fact, competing before different judges in strong classes, "Sir Jack" has not been beaten.

The following are some of the prizes which have been awarded to him :—

Lismore Grand National, in 1910: First and champion aged Jersey bull; first breeder's prize and first in group; also reserve grand champion bull on ground of any breed.

Lismore Show, in 1911: First and champion aged Jersey bull.

Mullumbimby Show, in 1911: First and champion aged Jersey bull.

Bangalow Show, in 1911: First and champion aged Jersey bull; also reserve grand champion bull.

Lismore Show, in 1912: First and champion aged Jersey bull, and first in group.

Casino Show, in 1912: First and champion aged Jersey bull.

Bangalow Show, in 1912: First and champion aged Jersey bull; and first for dairy bull of any age or breed.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

COLOUR OF BERKSHIRE PIGS.—"H.A.W.": Berkshires generally breed fairly true to type, but occasionally animals are noticed with reddish brown, bronze or copper spots. This is put down to reversion to original colour, and the Berkshire authorities maintain that it is no sign of impurity. Probably the rustiness in ear-colour mentioned by you is due to this.—GEORGE VALDER.

CASTRATING TURKEYS.—"H.A.W.": Caponising of male fowls is done with the object of keeping the flesh tender to almost any age. Male turkeys do not become hard in flesh like roosters, until they are over 3 years old or more. While there is no advantage in caponising turkeys, there is always the risk of losing the birds.—GEORGE BRADSHAW.

SHELL-GRIT AND SCRATCHING YARDS FOR POULTRY.—"W.C." (Clarence River): The sample of shore-gravel forwarded is very similar to the shell-grit used in the pens for the Hawkesbury College Egg-laying Competition. The sample is finer than our bulk delivery, but it is all the better for hens. Scratching-yards are necessary, and should be in the corners of the pens. Corn-cob cores would be too rough. Soft litter is the best —waste chaff, straw, waste grass, and ashes, or anything of that sort.—D. S. THOMPSON.

EFFECT OF PRUNING UPON DATE OF FRUITING.—"H.L.": I am not aware of any experiments having been conducted which would give any information on the subject of whether pruning early or late makes any difference in the date of fruit-ripening. From general field observation, however, it has no effect whatever.

Late pruning can only be valuable as far as late frosts are concerned, from the fact of the trees being likely to burst out at a later period of growth. Whitewashing the trees with a heavy dressing will retard the bursting of the bloom buds, and in this way they may be protected from injury.—J. G. R. BRYANT.

DISEASED PEACH-LEAVES.—"F.J.T": The leaves submitted were badly affected with Peach Leaf-curl. It is necessary to spray for this trouble early in spring, when the buds are swelling. Lime-sulphur solution should be used.—J. G. R. BRYANT.

GRASSHOPPERS DESTROYING FRUIT-TREES AND TOMATOES.—"J.H.K.": There is only one way to destroy grasshoppers when in large numbers, either flying or as hoppers, and that is to use an arsenical spray. A leaflet giving formula has been posted to you. If the grasshoppers come into the orchard, grass or hay, &c., should be scattered under the trees and sprayed; even dried horse-manure would serve the purpose. It would be useless to spray the trees, as the grasshoppers would eat everything before they succumbed.—W. W. FROGGATT.

CUT-WORMS DESTROYING FRUIT-TREES AND MAIZE.—"F.H.": Laying poisoned bran round the trees is the best method of destroying cut-worms. The proportions are 1 oz. of Paris green to 1 lb. of bran; mix well dry; and then add water to which a little salt has been added, and make the poisoned bran into a regular loose mash. Scatter it under and around the trees. The caterpillars coming out to feed on the trees find the poisoned bran, and the pests are soon cleared out.—W. W. FROGGATT.

MITES ON GRAPE-VINES.—"R.A.W." (Parramatta): The specimen of vine leaves submitted is affected by a parasite acarian called *Phytoptus vitis*, which has become very common among the vineyards round Sydney. This parasite does not interfere with the proper course of the vegetation, and it is very seldom that any damage is done by it.—M. BLUNNO.

WHEATS FOR QUIRINDI.—"A.P.": For the black soil at Quirindi, of the wheats you mention, I should select Marshall's No. 3, Federation and Comeback, to be sown in this order. For very late sowing, Bunyip would be best for grain and Thew for hay. The early and midseason sown wheats can be sown more lightly than the late. Sow from 30 to 40 lb. per acre for early and midseason, and 40 to 60 lb. for late sowing.—GEORGE VALDER.

Orchard Notes.

W. J. ALLEN.

JANUARY.

Cultivation.

SHOULD rain fall during the month, the soil should receive a thorough cultivation immediately it is dry enough, and all young trees would benefit by having the soil which may have been missed by the cultivator well loosened up. Where any weeds have made their appearance in the orchard, the soil should be well stirred up with the cultivator—as all weeds, summer grass, &c., tend to rob the ground of the moisture which at this time of the year is so badly needed for the trees and vines.

Irrigation.

Wherever water is available to irrigate fruit-trees or vines, it is more than likely that they will require a thorough soaking this month. See that the water is confined to furrows, and be careful not to allow it to flood over any portion of the land; also, that the best use is made of such water, and that none of it is allowed to run to waste.

After the soil has been well soaked, and as soon as the land is sufficiently dry to work, give it two deep cultivations in order to bring it to a proper state of tilth. Also see that all vines and trees are well worked around with a fork-hoe while the soil is still damp. This will keep the ground from baking and prevent excessive evaporation.

Codling Moth.

See that all bandages are given careful and regular attention, and that all infested fruit is picked from the trees and ground, and destroyed by boiling or burning, in accordance with the regulations under the Fruit Pests Act. Give final spraying with arsenate of lead.

San José Scale.

Wherever it is found that trees are affected with this scale, they should receive a thorough spraying, as soon as the crop is harvested, with the special resin wash. Leaflets can be had on application to the Department of Agriculture.

Red, Brown, and Indian Wax Scale on Citrus Trees.

Trees may be either fumigated or sprayed for the destruction of scale insects. The work may be commenced this month provided the trees are in good strong condition; but, as this is usually a very hot month, the work will have to be done on cool days or at night, but never fumigate during the heat of the day at this time of the year.

Summer Pruning.

Wherever young apple, pear, or apricot trees are found to have too much growth throughout the centre of the trees they should be thinned out, cutting back the superfluous growth to within about 3 inches of the main limbs or spurs from which they spring. This will open up the tree so as to admit light and air, which are both necessary for the proper development and ripening of wood, as well as assisting the tree in its efforts to develop fruit spurs.

In some orchards in the tableland districts, where the younger trees are not well protected from heavy windstorms, it is advisable to pinch back the leaders, so as to check the rapid upward flow of sap. By doing this the wood will be caused to ripen better, and there is the greater protection against the wind.

Re-working Old Trees.

The latter part of this month is the best time to bud to better varieties all poor or worthless varieties of fruit trees found growing in the orchard. Be sure that the buds to be used are taken from trees which have borne fruit of the very best quality. Insert them on the outer or underneath side of the limbs, where it will be found that the bark usually raises more easily than on the upper side, and where they are more apt to form a well shaped tree than if the buds had been inserted on the upper or inner side of such limbs. [*See* Miscellaneous Publication 1,396.]

Vines.

See that no suckers are allowed to remain on the vine, and in coastal districts it will be found advisable to top them when they are putting on strong growth.

Preparing for Cover Crops.

Do not forget to order black tares, peas, rape, rye seed, or whatever crop it is intended to sow for green manure between the trees. The seed should be ordered towards the end of the month, so that it will be on hand when required.

Marketing Fruit.

See that any fruit intended for market is not allowed to become too ripe before being picked, else by the time it reaches the consumer it will be in an over-ripe condition. Grade all fruit evenly and pack it neatly and securely, so that it will present a good appearance when put before prospective buyers.

Brown Fruit Rot.

I cannot too strongly impress upon the fruit-growers the very great necessity for regularly and thoroughly picking up all infected fruit and destroying same.

At the Hawkesbury Agricultural College orchard, where the lime-sulphur spray is used every winter, there are many varieties of peaches and nectarines, and we have found not 2 per cent. of the crop affected with Brown Fruit Rot this season. Stone-fruit orchards planted not 1½ miles away are badly infected with this fungus.

Government Stud Bulls available for service at State Farms, or for lease.

Breed	Name of Bull	Sire.	Dam.	Stationed at—	Engaged up till—
Irish Short-horn.	Limerick Lad (imp.)	.....	.....	Berry	*
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (im.)	Wollongbar Farm	*
,, ...	Imperialist ...	Florio	Lady Nancy of Minembah.	,, ,,	*
,, ...	March Pansy ...	Earl March ..	Australian Pansy	Grafton Farm ..	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
,, ..	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	,, ,,	*
,, ...	Elaine's Heir ...	Thessalian II ...	Wagga Elaine	Yanco Farm ...	*
,, ...	Jamaica Jack ...	Sir Jack ..	Rum Omelette (imp.).	Wollongbar Farm	*
,, ...	Royal Blood ...	Berry Melbourne	Calceolus ...	,, ,,	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie .	Berry Farm ...	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Cowra Farm ..	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Swan Bay... ...	22 June, '13.
,, ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Kyogle	28 Feb., '13.
,, ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.)	Maclean	15 Jan., '13.
,, ...	Prince Souvia ...	Vivid's Prince...	Souvenir(imp.)	Grafton	3 April, '13.
,, ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Casino	— June, '13.
,, ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '13.
,, ...	Sunshine ...	King of the Roses	Princess Vivid	Grafton Farm ...	*
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	Claudius (imp.)	Golden Star II..	Claudia's Pride(imp.).	Tweed River ...	12 Feb., '13
,, ...	Trengwainton VillageFavourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
,, ...	Good-bye ..	Western Duke...	Souvenir (imp.)	Casino	28 May, '13.
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Jones' Island ...	1 June, '13.
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (im.)	Pambula	1 May, '13.
,, ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Lismore	3 July, '13.
,, ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel(imp.).	Murwillumbah ...	10 May, '13.
,, ..	Prince of Warren Wood (imp.).	Kingsmoor Governor (1952)	Quail (7051)	Frederickton ...	1 May, '13.
,, ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Macksville ...	14 June, '13.
,, ...	Rosehill (imp.)..	Northesk (2073)	Faultless Footsteps (6132)	Raymond Terrace	19 June, '13.
,, ...	Duke of Orleans..	Godolphin Arthur (1664)	Flower of the Preel 3rd (imp)	H.A. College, Richmond	19 Dec., '13.
Ayrshire ...	Jamie's Heir ..	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm.	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ...	*
,, ...	Orphan Boy ..	Songster of Greystanes.	Rosamond ...	Glen Innes Farm..	*
,, ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A.College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aieme Chin(imp.)	Bratha 4th ...	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ..	Bathurst Farm ...	*

Available for service only at the Farm where stationed.

Department of Agriculture,
Sydney, 2nd January, 1913.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

SHORTHORNS.—Royal Success: sire, Royal Hampton 10th (imp.); dam, Waratah; calved 10th October, 1910; colour, red. Price, **£30.**

Waratah is by Dora's Boy from Australian Pansy. Australian Pansy was by Airy Knight 2nd from Pansy 4th (imp.). Dora's Boy was by Cornish Boy (imp.), from Lady Dora (imp.).

Waratah yielded 5,305 lb. of milk last season, testing 3·6 per cent., or equal to 223 lb. of butter. Australian Pansy gave 5,822 lb. of milk on her first calf, with an average test of 3·8 per cent. butter-fat. Lady Dora (dam of Dora's Boy) gave 9,560 lb. of milk in 265 days.

This bull combines the successful Dora's Boy and Pansy blood.

Duke of Hampton: sire, Royal Hampton 10th (imp.); dam, Flower Girl; calved 14th May, 1911; colour, red and a little white. Price, **£15.**

Flower Girl is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy. Australian Pansy is by Airy Knight 2nd from Pansy 4th (imp.).

Flower Girl, on second calf, in thirty-three weeks, gave 4,513 lb. of milk, with a test of 3·7 per cent. butter-fat, and is still milking well. Forest Pansy gave 5,785 lb. of milk in forty-one weeks, yielding equal to 272 lb. of butter. Australian Pansy gave 5,822 lb. of milk on her first calf, with an average test of 3·8 per cent. butter-fat.

GUERNSEY.—Belfast: sire, King of Roses (imp.); dam, Flaxy 2nd; calved 20th September, 1911; colour, lemon and white. Price, **£40.**

Flaxy 2nd is by Rose Prince (imp.) from Flaxy (imp.). Flaxy (imp.) in thirty-seven weeks gave 6,443 lb. of milk, which it is estimated produced 334 lb. of butter. Flaxy 2nd developed a habit of sucking herself, and the only record shows 3,333 lb. of milk, testing 5 per cent.

HOLSTEINS.—Robert the Devil: sire, Foxfield Chevin Bob (imp.); dam, Miss Muller; calved 14th February, 1912. Price, **£15.**

Miss Muller is by Hollander from Margosa. Margosa is by Garfield (imp.) from Maggie Obbe. Maggie Obbe is by Obbe (imp.) from Margaretha (imp.).

Bobs: sire, Froxfield Chevin Bob (imp.); dam, Margaret Anglin; calved 5th April, 1912. Price, **£12.**

Margaret Anglin is by Hollander from Margosa.

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—Beaucaire's Baby: sire, Monsieur Beaucaire; dam, Rosey of Wollongbar; calved 28th March, 1911. Price, **£40.**

Captain Rose: sire, Monsieur Beaucaire; dam, Parson's Red Rose 2nd (imp.); calved 25th December, 1911. Price, **£35.**

Monsieur Beaucaire is by Calm Prince from Flaxy (imp.). Calm Prince was by Rose Prince (imp.) from Gentle (imp.). Parson's Red Rose yielded 4,860 lb. of milk in a lactation period, equal to 268 lb. of butter.

BULLS FOR SALE—*continued.*

AT WOLLONGBAR EXPERIMENT FARM—*continued.*

GUERNSEY.—St. Michael of Wollongbar : sire, Trequean Mike (2103); dam, Polly 2nd of Roque Balan (imp.); calved 21st August, 1911. Price, **£40.**

Polly 2nd of Roque Balan (imp.) yielded 4,157 lb. of milk, equal to 235 lb. of butter.

AYRSHIRE.—Old Jock : sire, Jamie's Heir ; dam, Auchen Dandy ; calved 22nd November, 1911. Price, **£15.**

Auchen Dandy is by Daniel (imp.) from Dandy of Rattenraw (imp.). She yielded 4,273 lb. of milk on her second calf, equal to 216·5 lb. of butter.

HOLSTEIN COWS FOR SALE.

WOLLONGBAR EXPERIMENT FARM.

Name.	Date of Birth.	Sire.	Dam.	Price.
				£
Lolkje Field (not in calf) ...	12 Nov., 1904 ...	Garfield	Lolkje	20
Marjorie (in calf)	5 Sept., 1906 .	Chairman	Margaretha ...	30
Fraulein Arama (not in calf)..	4 Feb., 1907 ...	The Hague ...	Dina's Douwe ...	25
Marigold (not in calf) ...	25 Feb., 1907 ...	The Hague .	Margosa	25
Maggie Hague (in calf) ...	28 Aug., 1907 ...	The Hague ...	Maggie Obbe ...	30

H. C. L. ANDERSON, Under Secretary.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1913.

Society.	Secretary.	Date.
Albion Park A., H., and I. Association	M. A. Brown ...	Jan. 15, 16
Gosford and Brisbane Water A. and H. Association..	R. J. Baker ..	,, 24, 25
Kiama A. Association	G. A. Somerville ..	,, 24, 25, 27
Wollongong A., H., and I. Association	M. A. O'Donnell...	,, 30, 31, Feb. 1.
Berry A. Association	C. W. Osborne ...	Feb. 5, 6
Moruya A. and P. Society	H. P. Jeffery ...	,, 5, 6
Alstonville A. Society	W. M. Monaghan	,, 11, 12
Tamworth P. and A. Association	J. R. Wood ...	,, 11, 12, 13
Shoalhaven A. and H. Association (Nowra)	H. Rauch... ...	,, 12, 13
Hawkesbury District A. Association (Windsor) ...	H. S. Johnston ...	,, 13, 14, 15
Guyra P., A., and H. Association	P. N. Stevenson...	,, 18, 19, 20
Cobargo A., P., and H. Society	T. Kennelly ...	,, 19, 20
Ulladulla A. Association	J. Boag	,, 19, 20
Nambucca A. and H. Association	J. Egan	,, 20, 21
Wyong A. Association	J. H. Kay ...	,, 20, 21, 22
Central Cumberland A. and H. Association	H. A. Best ...	,, 21, 22
Dapto A. and H. Society	J. H. Lindsay ...	,, 25, 26
Bangalow A. and I. Society	W. H. Reading ...	,, 25, 26, 27
Armidale and New England P., A., and H. Assoctn.	A. McArthur ...	,, 25–28
Campbelltown A. Society	F. Sheather ...	,, 26, 27
Gulgong A. and P. Association	D. H. Spring ...	,, 26, 27
Gunning P., A., and I. Society...	J. R. Turner ...	,, 26, 27
Manning River A. and H. Association (Taree) ...	S. Whitbread ...	,, 26, 27
Tumut A. and P. Association	T. E. Wilkinson...	,, 26, 27
Armidale and New England P., A., and H. Assoctn.	A. McArthur ...	,, 26–28

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1913.

Society.	Secretary.	Date.
Inverell P. and A. Association	J. McIlveen ...	Feb. 26, 27, 28
Robertson A. and H. Society	J. D. Wood ...	,, 27, 28
Northern A. Association (Singleton)	E. J. Dann ...	,, 27, 28, Mar. 1.
Nepean District A., H., and I. Society (Penrith) ...	P. J. Smith ...	,, 28, Mar. 1.
Southern New England P. and A. Association, Uralla.	W. McCrossin ...	Mar. 4, 5
Mudgee A., P., H., and I. Association	P. J. Griffin ...	,, 4, 5, 6
Tenterfield P., A., and M. Society	F. W. Hoskin ...	,, 4, 5, 6
Cumnock P., A., and H. Association	K. A. Abernethy..	,, 5
Bega A., P., and H. Society	W. A. Zingel ...	,, 5, 6
Braidwood P., A., and H. Association...	L. Chapman ...	,, 5, 6
Camden A., H., and I. Society...	A. Thompson ...	,, 5, 6, 7
Tumbarumba and Upper Murray P. and A. Society...	E. W. Figures ...	,, 5, 6, 7
Newcastle A., H., and I. Association	C. W. Donnelly ...	,, 5, 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy ...	,, 6, 7
Port Macquarie and Hastings District A. and H. Society	T. Dick	,, 6, 7
Berrima District A., H., and I. Society (Moss Vale)	I. Cullen	,, 6–8
Blayney A. and P. Association...	H. R. Woolley ...	,, 11, 12
Luddenham Agricultural Society	F. Shawe	,, 11, 12
Central New England P. and A. Association (Glen Innes)	G. A. Priest ...	,, 11, 12, 13
Narrabri P., A., and H. Association	D. J. Bridge ...	,, 11, 12, 13
Bombala A. Society	W. G. Tweedie ...	,, 12, 13
Molong P. and A. Association	W. J. Windred ...	,, 12
Macleay A., H., and I. Association	E. Weeks	,, 12, 13, 14
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins ...	,, 12, 13, 14
Goulburn A., P., and H. Society	G. G. Harris ...	,, 13, 14, 15
Gundagai A. Society	A. Elworthy ...	,, 18, 19
Coramba District P., A., and H. Society	H. E. Hindmarsh ,,	26, 27
Cooma P. and A. Association	C. J. Walmsley ...	April 2, 3
Coonabarabran P. and A. Association	G B. McEwen ...	,, 2, 3
Bathurst A., H., and P. Association	J. Bain	,, 2, 3, 4
Hunter River A. and H. Association	E. H. Fountain ...	,, 2–5
Wauchope P., A., and H. Society	A. D. Suters ...	,, 3, 4
Cobar P. and A. Association	D. H. Dunlop ...	,, 5, 6
Adaminaby P. and A. Association	W. Delaney ...	,, 9, 10
Gloucester A., H., and P. Association	S. J. Bignell ...	,, 9, 10
Clarence P. and A. Society (Grafton)	G. N. Small ...	,, 9, 10, 11
Orange A. and P. Society	W. Tanner ...	,, 9, 10, 11
Dorrigo A., H., and I. Society	W. R. Colwell ...	,, 10, 11
Moree P. and A. Society	D. E. Kirkby ...	,, 15, 16, 17
Dungog A. and H. Association	C. E. Grant ...	,, 16, 17
Merriwa A. and P. Association	V. Budden ...	,, 16, 17
Upper Manning A. and H. Association (Wingham)...	D. Stewart, junr...	,, 23, 24
Warialda P. and A. Association	A. J. Devine ...	,, 23, 24, 25
Richmond River A., H., and P. Society	D. S. Rayner ...	,, 29, 30 May 1
Kyogle P., A., and H. Society	M. P. Dunlop ...	May 7, 8
Deniliquin P. and A. Society	L. Harrison ...	July 17, 18
Murrumbidgee P. and A. Association (Wagga) ...	A. F. D. White ...	Aug. 19, 20, 21
Manildra P. and A. Association	C. M. Podmore ...	Sept. 3
Germanton P., A., and H. Society	J. S. Stewart ...	,, 3, 4
Young P. and A. Association	T. H. Tester ..	,, 9, 10, 11
Albury and Border P., A., and H. Society	W. I. Johnson ...	,, 9, 10, 11
Cootamundra A., P., H., and I. Association... ...	T. Williams ...	,, 16, 17
Cowra P., A., and H. Association	G. S. Fisher ...	,, 16, 17
Murrumburrah P., A., and I. Association	J. A. Foley ...	,, 23, 24

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VOL. XXV. PART 2. FEBRUARY 3, 1913.

Agricultural Gazette of New South Wales.

Field Experiments with Wheat, 1912.

HAWKESBURY AGRICULTURAL COLLEGE.

A. V. DONNAN, Experimentalist.

THE Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that final conclusions cannot yet be drawn from these trials, as they have only been conducted for a year or two. Later, when results for, say, five years are available, a summary will be prepared, as sufficient evidence should then be available to enable conclusions to be formed. Meanwhile it is felt that the public are entitled to know the results obtained each year.

The quantities of fertilisers used per acre in the various manurial experiments have been fixed as follow:—

Experiment III.—To each of the wheat and maize crops in the three-year rotation, phosphoric acid 20 lb., sulphate of potash 7½ lb., and nitrogen equal to that contained in bone-dust containing 20 lb. phosphoric acid, approximately 3½ lb., making a total of phosphoric acid 40 lb., sulphate of potash 15 lb., and nitrogen, approximately 7 lb., during each complete rotation.

Experiments V and VI.—To each of the wheat and maize crops in the three-year rotation, phosphoric acid 20 lb., sulphate of potash 7½ lb., and nitrogen 6 lb., making a total of phosphoric acid 40 lb., sulphate of potash 15 lb., and nitrogen 12 lb., during each complete rotation.

Experiment IV.—In this experiment at the College, only the maize and cowpea crops are manured. The cowpea manuring is complementary to the maize manuring, *i.e.*, a plot receiving fertiliser with maize will receive with the cowpea the other components of a complete manure. Every plot during three years receives the same complete fertiliser, per acre, which has been fixed at phosphoric acid 20 lb., sulphate of potash 15 lb., and nitrogen 6 lb The dressing of nitrogen has not been reduced because (1) the supply has to cover a period of three years, (2) the soil is naturally poor, and (3) the manure is applied to a maize, not a wheat, crop.

The amounts of the various fertilisers have been calculated from the following guarantee:—

Superphosphate, 17 cent. phosphoric acid.
Thomas' phosphate, 17 per cent. phosphoric acid.
Rock phosphate, 32 per cent. phosphoric acid, and sulphate of potash, 52 per cent. potash.
Bone charcoal, 30 per cent. phosphoric acid.
Bone-dust, 22 per cent. phosphoric acid, and 5 per cent. nitrogen.
Dried blood, 13·36 per cent. nitrogen.
Sulphate ammonia, 20 per cent. nitrogen.

EXPERIMENT I.—VARIETY TRIAL WITH WHEAT.

Object.—To ascertain the most suitable varieties of wheat to grow under the conditions obtaining in the Hawkesbury-Nepean district, with special reference to rust resistance, and yield and quality of hay.

Rotation Employed.

The rotation extends over three years, and is as follows, A, B, and C, representing first, second, and third years in the rotation :—

October A to April B—maize.
April B to November B—rape.
November B to March C—fallow.
April C to November C—wheat.
December C to April A—cowpea.
April A to September A—fallow.

Thus every alternate eighteen months the crops will be cowpea, fallow, maize,—rape, fallow, wheat.

Varieties Tried.

Including the check, nine varieties are tried in the experiment. In Table A these are shown in the order of planting.

Changes from 1911 List.

In the variety trial for 1912 Huguenot and Comeback were replaced by Florence and Zealand, these last-named varieties being more suited to the conditions in this district, although Zealand will probably suffer in a severely rusty season. Florence and Zealand both occupied areas in the crop on the commercial section of the farm this year, and both gave very good results.

Check Variety.

Warren was planted in all buffer and check plots. It is the most rust-resistant of all the wheats at the College, and is also second to none as a hay wheat.

Soil.

The soil throughout Block E1, on which the experiment was carried out, consists of a white clay loam. Running across one end of the line of planting is a stretch of reddish sandy loam, a more fertile soil, which produces better crops.

Previous History.

Prior to November, 1909, this land formed part of a cow pasture. Between November, 1909, and March, 1911, when the land was obtained for experimental purposes, crops of maize for ensilage and oats for hay were taken from the land. In May, 1911, rape was sown and ploughed in in the following September.

Preparation for Planting.

The rape crop made considerable growth after being ploughed in. This second growth was turned under in January, 1912, and the ground harrowed. During February, March, and April the land was harrowed twice and skim-ploughed once. From the 7th to 14th May the ground was disc-harrowed deeply and tine-harrowed.

Planting.

On 15th May the ground was rolled and sown with the various varieties. A set of light harrows followed the seed drill.

The varieties were sown at the rate of 1¼ bushels (75 lb.) per acre, drilled in with a 15-disc wheat drill. No manure was applied to the ground.

Dimensions of Plots.

As shown in sketch A, each plot is 16 links x 10 chains. Along the middle of this the wheat drill sows fifteen rows, each 7 inches apart. A space of 2 feet 4 inches separates the adjoining rows of any two plots.

The Season.

The rainfall from the beginning of March to the date of sowing (15th May) amounted to 5·015 inches.

The rainfall from planting till harvesting was as follows:—

May	...	2·21 inches.	August ...	2·01 inches.	
June	...	2·215 „	September ...	·34	„
July	...	7·905 „	October (24th)	·84	„
			Total ...	15·52	„

The ground was in splendid tilth at seeding, and ideal conditions obtained until July, when heavy and continuous rains set the soil down hard. From September onward dry weather and heavy drying winds were experienced. These conditions, combined with the compaction and cracking of the soil, spoilt what would otherwise have been exceptionally heavy yields.

Rust made its appearance in the crops very early this year, but failed to develop to any extent as the season advanced, probably owing to the dry weather experienced.

Notes on Growth.

With the exception of Warren and Firbank, the germination throughout was very good, Cedar and John Brown showing up best. Warren germinated slowly, and Firbank very slowly and sparsely.

During the first few weeks' growth a large area of Cleveland and Zealand was eaten down by rabbits or hares.

The dry spell and hot winds experienced during the last stages of growth caused varying amounts of dead flag throughout the varieties. Firbank and Bunyip suffered more than the others in this respect. The last two varieties to be cut—Zealand and Cleveland—suffered from the attacks of cutworms for several days previous to harvesting.

Harvesting.

Just previous to harvesting a length of 28·5 links was cut off from each end of each plot. The remainder of each plot, an area of one-eighth acre, was cut for comparative purposes when in full flower, stooked until thoroughly dry, and weighed in the field.

Maturity.

The wheats matured in the following order :—

Bunyip,	cut by hand	...	20th	September.
Firbank,	,, ,,	...	24th	,,
Florence,	,, ,,	...	30th	,,
Thew,	,, ,,	...	2nd	October.
Cedar,	,, ,,	...	8th	,,
John Brown,	,, ,,	...	15th	,,
Warren,	,, machine	...	16th	,,
Zealand,	,, hand	...	23rd	,,
Cleveland	,, ,,	...	25th	,,

The crops harvested by hand were cut as far as possible to leave the same length of stubble as with the machine.

Rust on Varieties at Harvesting.

At harvesting all rust—mainly spring rust (*Puccinia rubigo-vera*)—was confined to the leaf. The varieties were affected in the following degrees :—

Firbank, Bunyip, } fairly heavy rust.
Zealand, fair amount.
Cleveland, Florence, } small amount.
Thew, very small amount.
Cedar, John Brown, } trace.
Warren, nil.

Quality of Hay.

All the varieties, with the exception of Bunyip and Cedar, are first-class hay-wheats. Bunyip and Cedar (the latter in a lesser degree) fall short of first-class on account of their scanty flag.

Results for Year 1912.

The results are given in Table B. The percentage yields of the various varieties were as follow :—

(1) Cleveland	... ...	109·16 per cent.
(2) Cedar	... ...	107·96 ,,
(3) Florence	... ...	103·91 ,,
(4) John Brown	... ...	100·38 ,,
(5) Warren	... ...	100·00 ,,
(6) Thew	... ...	93·16 ,,
(7) Zealand	... ...	92·17 ,,
(8) Bunyip	... ...	56·14 ,,
(9) Firbank	... ...	48·42 ,,

Average yield per acre, 2 tons 7 cwt. 1 qr. per acre.

Comments.

The low yield of Firbank was undoubtedly due to bad germination of the seed. Bunyip and Firbank also suffered more than the other varieties in the hot, dry spell during September and October. The yields of Cleveland and Zealand were reduced by an unknown amount by the attacks of cutworms.

TABLE A.

Showing the arrangement of Plots.

Width of Plot = 16 links.
Length of Plot = 10 chains.
Area harvested = $\frac{1}{8}$ acre.

BUFFER (20 links wide).	
1. (*Check.*)	Warren.
2.	Bunyip.
3.	Firbank.
4. (*Check.*)	Warren.
5.	Florence.
6.	Thew.
7. (*Check.*)	Warren.
8.	Cedar.
9.	John Brown.
10. (*Check.*)	Warren.
11.	Cleveland.
12.	Zealand.
13. (*Check.*)	Warren.
BUFFER (unlimited).	

TABLE B.—Showing results from 1912 Wheat Variety Trial. The 1911 results also appear worked out on the basis of Warren equals 100 per cent., and the average for the two years 1911 and 1912 appears in the right-hand column.

Variety.	Date of Planting.	Date of Harvesting.	Date of Weighing.	Yield per Plot.	Natural Yield per Plot.	Computed Yield per Acre.	Natural Yield per Acre.	Percentage Yield.	Percentage Yield of Varieties for 1911 Trial.	Average Percentage Yield to Date.
				lb.	lb.	t. cwt. qr. lb.	t. cwt. qr. lb.			
Warren	All Varieties Planted on 15th May, 1912.	16 October ...	30 October ..	676·5	676·5	2 8 1 8	2 8 1 8	100	100	100
Bunyip		20 September	14 ,, .	398	709	1 8 1 20	2 10 2 16	56·14	116·44	86·29
Firbank		24 ,, ...	14 ,, .	359	741·5	1 5 2 16	2 12 3 24	48·42	126·59	87·55
Warren		16 October ...	30 ,, ...	774	774	2 15 1 4	2 15 1 4	100	100	100
Florence... ..		30 September	14 ,, .	776	746·83	2 15 1 20	2 13 1 11	103·91	.....	103·91
Thew		2 October ...	14 ,	674	719·6	2 8 0 16	2 11 1 17	93·16	123·30	108·23
Warren		16 ,, ...	30 ,, ..	692·5	692·5	2 9 1 24	2 9 1 24	100	100	100
Cedar		8 ,, ..	31 ,, ...	750·5	695·16	2 13 2 12	2 9 2 17	107·96	112·80	110·38
John Brown ...		15 ,, ..	6 November	700·5	697·83	2 10 0 4	2 9 3 10	100·38	123·18	111·78
Warren		16 ,, ...	30 October ..	700·5	700·5	2 10 0 4	2 10 0 4	100	100	100
Cleveland ...		25 ,, ...	6 November	762·5	698·5	2 14 1 24	2 9 3 16	109·16	119·80	114·48
Zealand		23 ,, ..	6 ,, ...	642	696·5	2 5 3 12	2 9 3 4	92·17	.....	92·17
Warren		16 ,, ..	30 October ...	694·5	694·5	2 9 2 12	2 9 2 12	100	100	100
Comeback ...		.....	... ..	.	.. ...	.	...	. ...	120·29	120·29
Huguenot ...		.....	.....	... .	.. ...	.. ...	....	.....	59·15	59·15

EXPERIMENT III.—FERTILISER TRIAL WITH WHEAT, 1912.

The general conditions governing the carrying out of this experiment appeared in Volume XXII, page 844, of the *Agricultural Gazette.*

Object.—To determine the most suitable and economical source of phosphoric acid to use as a fertiliser for the staple and rotative crops of the Hawkesbury–Nepean District, *i.e.*, to determine the effect of climate upon the availability of the phosphoric acid in the different commercial phosphatic manures. In the experiment the manures are being applied to the wheat and maize crops.

Fertilisers on Trial.

The following phosphatic manures are being tried :—

(1) Bone-dust.
(2) Superphosphate.
(3) Rock phosphate.
(4) Bone charcoal.
(5) Thomas' phosphate or basic slag.

NOTE.—The nitrogen content of the soil will be maintained by green manuring, and the potash content by the application of sulphate of potash. As bone-dust contains, in addition to phosphoric acid, an appreciable amount of nitrogen, all other plots, excepting that which is unmanured, receive an equivalent amount of nitrogen in the form of dried blood.

The following points have been already dealt with in the report on Experiment I :—Rotation adopted, the dimensions of and arrangement of the crop in each plot, the reduction in area previous to harvesting, and the character of the season.

The Soil.

The soil on Block A1, on which the experiment was carried out this year, consists of a light-coloured clay loam containing gravel in its composition It is uniform in character throughout.

Previous History of the Soil.

The previous history of the block is identical with that of Block E1 on which the variety trial was carried out. With each of the maize and oat crops mentioned, the following manure was applied per acre :—

Superphosphate, 56 lb.
Dried blood, 28 lb.
Bone-dust, 28 lb.

The last application took place in the winter of 1910.

Preparation for Planting.

The rape crop grown in 1911 in accordance with the rotation set out, was ploughed in in September. A second growth which sprang up was turned under in January, 1912, and the ground harrowed. During April the land was skim-ploughed and harrowed. From 1st to 4th May the soil was disc-harrowed and harrowed, and on the 7th rolled.

Planting.

The experiment was planted on 8th May. Warren wheat was sown over the whole block at the rate of 1¼ bushels per acre, the various manures being drilled in at the same time. After sowing the ground was lightly harrowed.

Fertilisers Sown.

Table A shows the arrangement of the plots and the manures applied to each plot. The fertilisers were sown in such quantities that—

(1) Phosphatic fertilisers supplied, per acre, 20 lb. phosphoric acid.
(2) Potassic fertilisers supplied, per acre, 7½ lb. potash.
(3) Nitrogenous fertilisers supplied, per acre, the equivalent of the nitrogen contained in the bone-dust applied to plot No. 2, viz., $4\frac{5}{11}$ lb. per acre.

Notes on Growth.

Germination was satisfactory throughout the block. On the 8th June, all plots receiving phosphatic manure could be slightly distinguished by superior growth, No. 8 (Thomas' phosphate) being a little more forward than the rest. Ten days later No. 3 (superphosphate) was forging ahead, with No. 6, No. 8, and No. 2 close behind. During the heavy rains of July the ground was fairly soft, although no water lay on the surface. In August the crop began to show dead flag as a result of the continued wet condition of the soil. In September and October the soil caked and cracked with hot weather and drying winds. All through their growth the plots manured with phosphatic acid showed up better than the check plots. From July onwards, very little difference could be noticed between plots No. 3 (superphosphate), No. 6 (bone charcoal), and No. 8 (basic slag or Thomas' phosphate). Of the three, bone charcoal caused more growth in the last six weeks before cutting. Bone-dust (No. 2 plot) showed slightly inferior growth to the above three. Plots Nos. 3, 8, 6, and 2 were from about four to two days in the order mentioned earlier in maturing than the rest of the crop.

Harvesting.

By the 11th October, all ends of the plots not required for comparative purposes had been cut by hand and stooked away from the growing crop. On 17th October, the remainder was cut with the reaper and binder and stooked by the following morning. On 25th October, the sheaves were turned and restooked. The material dried very quickly, and was weighed on the 28th and 29th October.

Results.

The results are given in Table B. The manures gave the following percentage yields:—

(1) Superphosphate ...	...	180·06 per cent.
(2) Thomas' phosphate	...	180·03 „
(3) Bone charcoal ...	...	165·94 „
(4) Bone-dust ...	...	160·85 „
(5) Rock phosphate...	...	122·75 „
(6) Unmanured ...	...	117·49 „
(7) Check	...	100 „

Average yield per acre, 1 ton 15 cwt. 0 qr. 24 lb. per acre.

Comments.

The season experienced was of such a character that all manures applied had a good chance to produce results. The soil was always moist for the first three months of growth. During July there was a superabundance of moisture, which appeared to affect all plots to an equal extent. The average increase due to the application of a phosphatic manure amounted to 61·33 per cent.

In considering the average yields for the two years to date, the increased yield of 11·84 per cent. shown by an unmanured plot over the check—manured with dried blood and sulphate of potash—corresponds with the two years' results of experiment No. 5, where a plot fertilised with sulphate of ammonia and sulphate of potash has caused a decrease in yield of 7·04 per cent. from the check plots (unmanured). Superphosphate, bone-dust, bone charcoal and Thomas' phosphate all give an increase of between 30 per cent. and 40 per cent. Rock phosphate has a smaller increase, viz., 12·37 per cent.

TABLE A.

Showing arrangement of, and manures sown in, each plot.

Width of Plot=16 links.
Length of Plot=10 chains.
Area harvested=$\frac{1}{8}$ acre.

		lb. per acre.
	BUFFER (20 links wide).	
1. (*Check.*)	Sulphate of potash	14·5
	Dried blood	34
2.	Sulphate of potash	14·5
	Bone-dust	91
3.	Sulphate of potash	14·5
	Dried blood	34
	Superphosphate	118
4. (*Check.*)	Sulphate of potash	14·5
	Dried blood	34
5.	Sulphate of potash	14·5
	Dried blood	34
	Rock phosphate	62·5
6.	Sulphate of potash	14·5
	Dried blood	34
	Bone charcoal	66·5
7. (*Check.*)	Sulphate of potash	14·5
	Dried blood	34
8.	Sulphate of potash	14·5
	Dried blood	34
	Thomas' phosphate	118
9.	Unmanured.	
10. (*Check.*)	Sulphate of potash	14·5
	Dried blood	34
	BUFFER (20 links wide).	

TABLE B.

Showing results of 1912 and 1911. Opposite the number of the plot only the distinguishing phosphatic fertiliser appears. The full manure applied to each plot will be found in Table A.

Distinguishing Phosphatic Fertiliser.	Yield per Plot.	Natural Yield per Plot.	Computed Yield per Acre.	Natural Yield per Acre.	Per-centage Yield.	Per centage Yields for 1911.	Average Percent-age Yields to date.
	lb.	lb.	tons cwt. qr. lb.	tons cwt. qr. lb.			
1 (Check)	332	332	1 3 2 24	1 3 2 24	100·	100·	100·
2 Bone-dust ...	552	343·16	1 19 1 20	1 4 2 1	160·85	103·7	132·27
3 Superphosphate	638	354·3	2 5 2 8	1 5 1 7	180·06	99·2	139·63
4 (Check)	356½	365½	1 6 0 12	1 6 0 12	100·	100·	100·
5 Rock phosphate	464	378	1 13 0 16	1 7 0 0	122·75	102·	112·37
6 Bone charcoal ...	648	390½	2 6 1 4	1 7 3 16	165·94	97·5	131·72
7 (Check)	403	403	1 8 3 4	1 8 3 4	100·	100·	100·
8 Thomas' phosp.	707½	393	2 10 2 4	1 8 0 8	180·03	94·4	137·21
9 Unmanured ...	450	383	1 12 0 16	1 7 1 12	117·49	106·2	111·84
10 (Check)	373	373	1 6 2 16	1 6 2 16	100·	100·	100·

EXPERIMENT V.—FERTILISER TRIAL WITH WHEAT, 1912.

The general conditions governing the carrying out of this experiment were contained in the last wheat report, dated 10th January, 1912.

Object.- To determine the chemical needs of the soil, by the effect upon the yield of staple crops of the district of the continuous application of simple and mixed fertilisers to the same land and soil, in which the supply of organic matter is kept up by a suitable rotation.

Fertilisers.

The following fertilisers will be used :—

1. Superphosphate, to supply phosphoric acid.
2. Sulphate of potash, to supply potash.
3. (*a*) Sulphate of ammonia, to supply nitrogen;
   (*b*) The organic form of nitrogen will be contrasted with the inorganic by comparing the yields from plots manured with dried blood, superphosphate, and sulphate of potash, and with sulphate of ammonia, superphosphate, and sulphate of potash.

The quantity of fertiliser applied at each application will be on the following basis :—

Phosphatic manures to supply 20 lb. phosphoric acid per acre.
Potassic „ „ 7½ „ sulphate of potash „
Nitrogenous „ „ 6 „ nitrogen „

The various fertilisers will be applied to the maize and wheat crops.

Check Plots.

The check plots, comprising the first and every succeeding third plot in the series, will not be manured in any way.

The following points have been already dealt with in Experiments I and III :—(1) Rotation adopted, (2) character of soil, (3) previous history, (4) preparation for planting, (5) character of season, (6) dimensions of and arrangement of crop in the plots, (7) reduction in area of the plots previous to harvesting.

Planting.

This experiment was planted on 8th and 9th May. Warren wheat was sown over the whole block at the rate of 1¼ bushels per acre, the various manures being drilled in in the same operation. After sowing, the ground was lightly harrowed.

Table A shows the arrangement of the plots and the manures sown on each plot.

Notes on Growth.

Germination was satisfactory throughout the block. On the 8th June all plots receiving superphosphate, either singly or in a mixture, could be distinguished from the remainder by their superior growth. Throughout the growing period of the crop all check plots and those not receiving superphosphate showed the same amount of growth, while plots manured with superphosphate always showed to advantage. In July and early August the crop suffered from excess of moisture in the soil; in September and October from the heavy drying winds and compaction and cracking of the soil. Up till the end of the first week in September No. 9 (superphosphate and sulphate of potash) appeared the heaviest yielder, then Nos. 12, 11, 6, and 2 together. At harvesting time No. 2 appeared to be slightly ahead of the others (Nos. 12, 11, 6, and 9), between which hardly any difference could be detected.

Harvesting.

By the 11th October all ends of plots not required for comparative purposes were cut by hand and stooked away from the growing crop. On the 17th October the remainder was cut with the reaper and binder and stooked by the following morning. On 25th October the sheaves were turned and restooked. The material dried very quickly, and was weighed on 30th October.

Results.

As will be seen from Table B, the following results were obtained :—

	Per cent.
1. Sulphate of ammonia, superphosphate, sulphate of potash	150·84
2. Superphosphate, sulphate of potash	148·75
3. Dried blood, superphosphate, sulphate of potash	140·00
4. Sulphate of ammonia, superphosphate	139·57
5. Superphosphate	134·12
6. Check (no manure)	100·00
7. Sulphate of ammonia	94·25
8. Sulphate of potash	94·11
9. Sulphate of ammonia, sulphate of potash	84·95

Average yield per acre, 1 ton 10 cwt. 0 qr. 16 lb.

Conclusions.

The above results, combined with those of 1911 (shown in Table B), point to the fact that phosphoric acid is a necessary ingredient to apply to the soil on the experimental area. They also indicate that sulphate of potash and sulphate of ammonia, in the present quantities, do not affect the growth of the crop to any extent.

TABLE A.

Showing arrangement of, and manures sown in, each plot.

Width of Plot—16 links.
Length of Plot—10 chains.
Area harvested—$\frac{1}{5}$ acre.

	BUFFER (20 links wide).	
1. (*Check.*)	No manure.	lb. per acre.
2.	Sulphate of ammonia	30
3.	Superphosphate	118
4. (*Check.*)	No manure.	
5.	Sulphate of potash	14·5
6.	Sulphate of ammonia	30
	Superphosphate...	118
7. (*Check.*)	No manure.	
8.	Sulphate of ammonia	30
	Sulphate of potash	14·5
9.	Superphosphate	118
	Sulphate of potash	14·5
10. (*Check.*)	No manure.	
11.	Sulphate of ammonia	30
	Superphosphate	118
	Sulphate of potash	14·5
12.	Dried blood	45
	Superphospate	118
	Sulphate of potash	14·5
13. (*Check.*)	No manure.	
	BUFFER (20 links wide).	

TABLE B.

Showing results obtained in 1912. Also 1911 results and averages to date.

Plot Fertiliser.	Yield per Plot.	Natural Yield per Plot.	Computed Yield per Acre.	Natural Yield per Acre.	Per cent. Yield.	Per-centage Yield, 1911.	Average Percentage Yield to date.
	lb.	lb.	tons cwt. qrs lb	tons cwt. qrs. lb.			
(1) No manure (check) ...	444	444	1 11 2 24	1 11 2 24	100	100	100
(2) Sulphate of ammonia	409·5	434·5	1 9 1 0	1 11 0 4	94·25	96·45	95·85
(3) Superphosphate ...	570	425	2 0 2 24	1 10 1 12	134·12	140·05	137·08
(4) No manure (check) ...	415·5	415·5	1 9 2 20	1 9 2 20	100	100	100
(5) Sulphate of potash ..	372·5	395	1 6 2 12	1 8 1 0	94·11	106·39	100·25
(6) Sulphate of ammonia, superphosphate.	525	376·5	1 17 2 0	1 6 3 13	139·57	185·25	162·46
(7) No manure (check) ...	356·5	356·5	1 5 1 24	1 5 1 24	100	100	100
(8) Sulphate of ammonia, sulphate of potash.	295·5	347·83	1 1 0 12	1 4 3 8	84·95	100·97	92·96
(9) Superphosphate, sulphate of potash.	504·5	339·16	1 16 0 4	1 4 1 0	148·75	118·71	133·73
(10) No manure (check	330·5	330·5	1 3 2 12	1 3 2 12	100	100	100
(11) Sulphate of ammonia, superphosphate, sulphate of potash.	492	326·16	1 15 0 16	1 3 1 15	150·84	150·23	150·53
(12) Dried blood, superphosphate, sulphate of potash.	450·5	321·83	1 12 0 20	1 2 3 27	140	164·25	152·12
(13) No manure (check)	317·5	317·5	1 2 2 20	1 2 2 20	100	100	100

EXPERIMENT VI.—MANURIAL TRIAL WITH WHEAT.

The general conditions governing the carrying out of this experiment are the same as for Experiment V. The only difference between Experiments V and VI is that in the former fertilisers are applied to the staple crops in the rotation—wheat and maize—while in the latter they are applied to the rotative crops—rape and cowpea.

Object.—To determine the chemical needs of the soil by the effect upon the yield of staple crops of the district of the continuous application of simple and mixed fertilisers with rotative crops to the same land and soil in which the supply of organic matter is kept up by a suitable rotation.

Fertilisers.

The following fertilisers will be used:—

(1) Superphosphate to supply phosphoric acid.

(2) Sulphate of potash to supply potash.

(3) (*a*) Dried blood to supply nitrogen;

(*b*) The inorganic form of nitrogen will be contrasted with the organic by comparing the yields from plots manured with sulphate of ammonia, superphosphate, and sulphate of potash, and with dried blood, superphosphate, and sulphate of potash.

At each application—

Phosphatic manures to supply	20	lb.	phosphoric acid	per	acre.
Potassic ,, ,,	7½	,,	sulphate of potash	,,	
Nitrogenous ,, ,,	6	,,	nitrogen	,,	

Crops to be Manured.

The various fertilisers will be applied to the rape and cowpea plots.

The check plots, comprising the first and every succeeding third plot in the series, will not be manured in any way.

The following points have been already dealt with in Experiments I and III :—(1) Rotation adopted, (2) character of soil, (3) previous history, (4) preparation for planting, (5) character of the season, (6) dimensions of and arrangement of the crop in the plots, (7) reduction in area previous to harvesting.

Planting.

The various manures shown in Table A were sown on 23rd and 24th May, 1911, through an empty wheat drill. Broad Leaf Dwarf Essex rape was afterward broadcasted over the whole area. On 9th and 11th May, 1912, Warren wheat was sown in each of the plots at the rate of 1¼ bushels per acre. After sowing the ground was lightly harrowed.

Notes on Growth.

The crop germinated well, and no difference in growth was detected until after the heavy rains of July. These caused differences in the growth of the plots. The crop matured at the same time as the later plots in Experiment VI.

Harvesting.

This experiment was harvested in the same way and at the same time as Experiment V. The material was weighed on 29th October.

Results.

The yields are given in Table B. Following are the percentage yields :—

	Per cent.
(1) Dried blood, superphosphate	119·79
(2) Superphosphate, sulphate of potash	111·23
(3) Sulphate of potash...	104·65
(4) Dried blood, superphosphate, sulphate of potash ...	102·34
(5) Dried blood, sulphate of potash	100·62
(6) Sulphate of ammonia, superphosphate, sulphate of potash	100·00
(7) No manure (check)	100·00
(8) Superphosphate	91·90
(9) Dried blood	88·61

Average yield per acre, 1 ton 12 cwt. 0 qr. 22 lb.

Conclusions.

No conclusions can be drawn from the first year's results.

TABLE A.

Showing arrangement of the plots, and the manures sown in each plot.

	BUFFER (20 links wide).	
1. (*Check.*)	No manure.	lb. per acre.
2.	Dried blood	45
3.	Superphosphate	118
4. (*Check.*)	No manure.	
5.	Sulphate of potash	14·5
6.	Dried blood	45
	Superphosphate...	118
7. (*Check.*)	No manure.	
8.	Dried blood	45
	Sulphate of potash	14·5
9.	Superphosphate	118
	Sulphate of potash	14·5
10. (*Check.*)	No manure.	
11.	Dried blood	45
	Superphosphate...	118
	Sulphate of potash	14·5
12.	Sulphate of ammonia	30
	Superphosphate...	118
	Sulphate of potash	14·5
13. (*Check.*)	No manure.	

TABLE B.

Showing the manures applied to and results obtained from the various plots.

Plot Fertiliser.	Yield per Plot.	Natural Yield per Plot.	Yield per Acre, computed.	Natural Yield per Acre.	Percentage Yield, 1912.
	lb.	lb.	t. cwt. qr. lb.	t. cwt. qr. lb.	
(1) No manure (check) ..	317·5	317·5	1 2 2 20	1 2 2 20	100·
(2) Dried blood	293	330·7	1 0 3 20	1 3 2 11	88·61
(3) Superphosphate	316	343·8	1 2 2 8	1 4 2 7	91·90
(4) No manure (check) ...	357	357	1 5 2 0	1 5 2 0	100·
(5) Sulphate of potash ...	386	368·8	1 7 2 8	1 6 1 11	104·65
(6) Dried blood, superphosphate.	456	380·7	1 12 2 8	1 7 0 21	119·79
(7) No manure (check) ...	392·5	392·5	1 8 0 4	1 8 0 4	100·
(8) Dried blood, sulphate of potash.	462·5	459·7	1 13 0 4	1 12 3 9	100·62
(9) Superphosphate, sulphate of potash.	586	526·8	2 1 3 12	1 17 2 15	111·23
(10) No manure (check) ...	594	594	2 2 1 20	2 2 1 20	100·
(11) Dried blood, superphosphate, sulphate of potash.	591·5	578	2 2 1 0	2 1 1 4	102·34
(12) Sulphate of ammonia, superphosphate, sulphate of potash	562	562	2 0 0 16	2 0 0 16	100·
(13) No manure (check) ...	546	546	1 19 0 0	1 19 0 0	100·

MANURE FROM DAIRY COWS.

THE value to put on manure from dairy cattle is a very complex problem, and one that perhaps has not received due consideration. On many dairy farms the owners figure their profits from the direct cash returns, without regard to the direct value obtained from the manure produced. Figures obtained by experiments conducted by Professor W. J. Fraser, of the Illinois Experiment Station, U.S.A., furnish some interesting data.

The manure is figured at 11 tons per head, for cows producing 8,000 lb. of milk. On the 20-acre dairy farm at the University last year, cows which were kept in the barn during the winter and in a dry field during the summer produced 13 tons of manure per cow. The average value of the manure was put at 150 cents (6s. 3d.) per ton. At the Illinois Agricultural Experiment Station, on a three-year rotation of corn, oats, and clover, manure has increased the crop yield 160 cents (6s. 8d.) for each ton of manure used, figuring on the market value of the crops for the first three years after it is applied. No consideration is taken of the increased production from the effects of the manure after the first three years. At the Ohio Experiment Station the value of the crop yields has been increased 234 cents (9s. 9d.) for each ton of manure used.

From these figures, 150 cents (6s. 3d.) per ton is a conservative value to put on cow manure which has been well cared for. Cows which produce less than 8,000 lb. of milk will produce, on the average, under 11 tons of manure, and those giving over 8,000 lb. of milk will produce more manure, but it will be of better quality, owing to the fact that they are fed on more concentrates. The value of the manure is therefore lowered 50 cents (2s. 1d.) per cow for every 1,000 lb. decrease in milk production below 8,000 lb., and raised 50 cents per 1,000 lb. milk over 8,000 lb.

Varieties of Wheat and other Cereals.

Recommendations by the Department of Agriculture.

The annual conference of Departmental officers was held in Sydney on the 9th and 10th January, 1913, for the purpose of revising the list of varieties of wheat and other cereals recommended by the Department for cultivation, and of discussing other matters connected with the growing of cereals.

There were present:—Messrs. H. C. L. Anderson, Under Secretary; G. Valder, Superintendent and Chief Inspector; G. M. McKeown, Manager of Wagga Experiment Farm; R. W. Peacock, Manager of Bathurst Experiment Farm; R. H. Gennys, Manager of Glen Innes Experiment Farm; F. G. Chomley, Manager of Yanco Experiment Farm; M. H. Reynolds, Manager of Cowra Experiment Farm; F. Ditzell, Acting Manager, Coonamble Experiment Farm; H. J. Kelly, Manager, Nyngan Demonstration Farm; J. T. Pridham, Plant Breeder; H. Ross, Senior Inspector; A. H. E. McDonald and H. C. Stening, Inspectors of Agriculture; and A. V. Donnan, Experimentalist, Hawkesbury Agricultural College.

The classification of the wheat districts of the State, as adopted at last conference, was again adopted, as follows:—

Classification of Wheat Districts.

1. Coastal (embracing those districts bordering on the coast, and which are specially subject to rust);
2. Northern Tableland (of which Glen Innes Farm is representative);
3. Central Tableland (of which Bathurst Farm is representative);
4. South-western Slopes and Riverina (of which Wagga Farm is representative);
5. Central-western Slopes (of which Narromine, Dubbo, Gilgandra, Wellington, Cowra, Grenfell, Forbes, and Parkes are representative);
6. North-western Slopes (of which Tamworth and Gunnedah are representative);
7. Western Plains (of which Nyngan Farm is representative).

Classification of Varieties of Wheat.

In respect of time of maturity, the varieties of wheat recommended were classified as follows:—

Very Early.—Bunyip, Florence, Firbank.

Early.—Comeback, Thew, Steinwedel.

Mid-season.—Bobs, John Brown, Cedar, Warren, Federation, Bayah, Rymer.

Late.—Jonathan, Marshall's No. 3, Zealand, Yandilla King, Cleveland, Huguenot.

Very Late.—Haynes' Blue Stem.

In respect of time of sowing, the varieties mentioned above were recommended in inverse order.

Although mentioning certain varieties as suitable for very early and very late sowing, the Department does not recommend either practices. Farmers should avoid sowing either too early or too late.

Varieties Recommended.

It was decided that the following varieties of wheat should be recommended for cultivation during the year 1913 :—

A.—Dual-purpose Wheats.

Recommended for both Grain and Hay.

Variety.	Period of Sowing.	Districts.
Bobs	Mid-season and late	Central Tableland ; Western Plains.
Cleveland	Early and mid-season ...	Central Tableland ; cooler portions of North-western Slopes, Central-western Slopes, and South-western Slopes.
Comeback	Late	Northern Tableland ; South-western Slopes and Riverina.
	Mid-season and late	Central-western Slopes ; North-western Slopes ; Western Plains.
Firbank	Mid-season and late	Western Plains.
Florence	Mid-season and late	Central-western Slopes ; South-western Slopes and Riverina ; Central Tableland ; Northern Tableland ; Western Plains.
Haynes' Blue-stem..	Very early	Northern Tableland.
Jonathan	Early	Northern Tableland.
Marshall's No. 3 ...	Early	South-western Slopes and Riverina.
	Early and mid-season ...	Central Tableland ; Central-western Slopes ; North-western Slopes.
Rymer	Mid-season	Central Tableland.
	Early to mid-season	South-western Slopes and Riverina ; Central-western Slopes ; North-western Slopes.
Thew	Mid-season and late	Northern Tableland.
Warren	Early, mid-season, and late ...	Coastal.
	Mid-season	Northern Tableland ; Central-western Slopes ; North-western Slopes.
Yandilla King ...	Early	South-western Slopes and Riverina.
	Early and mid-season ...	Central Tableland ; North-western Slopes ; Central western Slopes.

B.—Wheats for Grain only.

Not recommended for Hay.

Variety.	Period of Sowing.	Districts.
Bunyip	Mid-season and late	South-western Slopes and Riverina ; Central-western Slopes ; Western Plains.
	Late	South-western Slopes and Riverina ; North-western Slopes ; Western Plains.
Federation... ...	Mid-season	Central Tableland ; South-western Slopes and Riverina ; Central-western Slopes ; North-western Slopes.

C.—Wheats for Hay only.

Not recommended for Grain.

Variety.	Period of Sowing.	Districts.
Firbank	Mid-season and late	South-western Slopes and Riverina; Central-western Slopes; Western Plains.
Huguenot	Early, mid-season, and late...	Coastal.
John Brown ...	Early, mid-season, and late...	Coastal; Central Tableland; North-western Slopes.
Steinwedel... ...	Early and mid-season ...	Western Plains.
Thew	Mid-season and late	South-western Slopes and Riverina; Central-western Slopes; North-western Slopes.
Zealand	Early	Central Tableland; South-western Slopes and Riverina; Central-western Slopes.

D.—Wheats Suitable for Green Feed and Soiling.

Variety.	Period of Sowing.	Districts.
John Brown ...	Early	Western Plains.
Huguenot	Early and mid-season ...	Coastal; Northern Tableland.
Thew	Early, mid-season, and late...	Coastal; Northern Tableland; North-western Slopes.
Florence	Early, mid-season, and late...	Coastal.

E.—Wheats for Further Trial.

The following varieties were selected as being suitable for continued experiments with wheats and manures at the Experiment Farms and in the Farmers' Experiment Plots:—

Variety.	Period of Sowing.	Districts.
Bayah	Mid-season	South-western Slopes and Riverina; Central-western Slopes.
Cedar	Early and mid-season ...	Northern Tableland; North-western Slopes.
Tarragon	Mid-season	Central Tableland; Central-western Slopes.
Sunset	Late	Western Plains.
Bomen	Mid-season	Central-western Slopes; South-western Slopes and Riverina; North-western Slopes.

The following wheats are already recommended as above for some districts. The conference considered them worthy of further trial in the following districts, though the varieties were not yet considered suitable for main crops there :—

Variety.	Period of Sowing.	Districts.
Jonathan	Mid-season	Central Tablelands; Central-western Slopes.
Warren	Mid-season	South-western Slopes and Riverina.

F.—Wheats to be grown under Irrigation.

In experiments carried out by the Department, the following wheats have given the best results when grown under irrigation for hay and green fodder :—

(1) Zealand.
(2) Huguenot.
(3) Marshall's No. 3.
(4) Florence (late sowing).
(5) Firbank (late sowing).

These experiments are being continued in several districts.

Wheats for Districts.

The wheats recommended by the Department for various purposes may be grouped in districts as follows :—

1. Coastal Districts.

[Embracing those districts bordering on the coast, and which are specially subject to rust.]

For Hay and Green Fodder—

Thew (early, mid-season, and late sowing) ;
Florence (early, mid-season, and late sowing) ;
Warren (early, mid-season, and late sowing) ;
John Brown (early, mid-season, and late sowing) ;
Huguenot (early and mid-season sowing).

2. Northern Tableland.

[Of which Glen Innes Farm is representative.]

For Grain or Hay—

Haynes' Blue-stem (very early sowing) ;
Warren (mid-season sowing) ;
Florence (mid-season and late sowing) ;
Thew (mid-season and late sowing).

For Green Fodder—

Huguenot (early and mid-season sowing) ;
Thew (mid-season and late sowing).

3. Central Tableland.

[Of which Bathurst Farm is representative]

For Grain or Hay—

Marshall's No. 3 (early and mid-season sowing);
Cleveland (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Rymer (mid-season sowing);
Bobs (mid-season and late sowing);
Florence (mid-season and late sowing).

For Grain only—

Federation (mid-season sowing).

For Hay only—

Zealand (early sowing);
John Brown (early, mid-season, and late sowing).

4. South-Western Slopes and Riverina.

[Of which Wagga Farm is representative.]

For Grain or Hay—

Yandilla King (early sowing);
Marshall's No. 3 (early sowing);
Rymer (early to mid-season sowing);
Florence (mid-season and late sowing);
Comeback (late sowing).

N.B.—Cleveland is specially suitable for cooler portions of this district, such as Harden and Germanton (early sowing).

For Grain only—

Federation (mid-season sowing);
Bunyip (late sowing).

For Hay only—

Zealand (early sowing);
Thew (mid season and late sowing).
Firbank (mid-season and late sowing).

5. Central-Western Slopes.

[Of which Narromine, Dubbo, Gilgandra, Wellington, Cowra, Grenfell, Forbes, and Parkes are representative.]

For Grain or Hay—

Marshall's No. 3 (early and mid-season sowing);
Yandilla King (early and mid-season sowing);
Rymer (early to mid-season sowing);
Comeback (mid-season and late sowing);
Florence (mid season and late sowing).

N.B.—Cleveland is specially suitable for the cooler portions of this district, such as Mudgee.

For Grain only—

Federation (mid-season sowing);
Bunyip (mid-season and late sowing).

For Hay only—

Zealand (early sowing);
Thew (mid-season and late sowing);
Firbank (mid-season and late sowing).

6. North-Western Slopes.

[Of which Tamworth and Gunnedah are representative.]

For Grain or Hay—

Yandilla King (early and mid-season sowing);
Marshall's No. 3 (early and mid-season sowing);
Rymer (early to mid-season sowing);
Warren (mid-season sowing);
Comeback (mid-season and late sowing).

N.B.—Cleveland is specially suitable for the cooler portions of this district, such as Inverell and Delungra.

For Grain only—

Federation (mid-season sowing);
Bunyip (late sowing).

For Hay—

John Brown (early, mid-season and late sowing);
Thew (mid-season and late sowing).

For Green Fodder—

Thew (early, mid-season and late sowing).

7. Western Plains.

[Of which Nyngan Farm is representative.]

For Grain or Hay—

Comeback (mid-season and late sowing);
Florence (mid-season and late sowing);
Firbank (mid-season and late sowing).

For Grain only—

Bunyip (late sowing).

For Hay only—

Steinwedel (early and mid-season sowing).

VARIETIES OF OATS, BARLEY, AND RYE RECOMMENDED BY THE DEPARTMENT OF AGRICULTURE.

At the Departmental Wheat Conference, held on the 9th and 10th January, and attended by Managers of Experiment Farms and Inspectors of Agriculture, it was agreed to make the following recommendations with regard to other cereals :—

Oats.

Coastal.—Algerian.

Central Tableland.—Algerian, Carter's Royal Cluster, Potato, Abundance.

Northern Tableland.—Algerian, White Tartarian, Potato, Big Four.

South-western Slopes and Riverina.—Algerian, Red Rust-Proof.

Central-western Slopes.—Algerian, Cape.

North-western Slopes.—Algerian.

Under Irrigation.—Abundance, Algerian.

Recommended for Further Trial.—Algerian Tartar (for Bathurst and Wagga Experiment Farms and Hawkesbury Agricultural College); Danish Island (for Northern Tableland); Kerson (for purposes of fine rack-hay).

Barley.

The following were considered good varieties of barley :—

Feed Barleys.—*Skinless.*—For green winter feed and stock grain in districts with comparatively mild winters.

Cape.—For green fodder and stock grain in the cooler districts.

Malting Barleys.—*Standwell* has proved best at Bathurst Experiment Farm, and *Maltster* has given good results; but at Wagga Experiment Farm the best varieties have proved to be *Kinver*, *Golden Grain*, and *Goldthorpe*, in the order named. *Gisborne* (or *Duckbill*) was recommended for further trial at Wagga Experiment Farm.

Ryes.

Black Winter.—For early winter fodder and grain.

Emerald.—For late feed.

White.—For collar-making.

It was pointed out that ryes are only suitable for cultivation on poor soils, generally in cold districts, for green feed. They are hardly suitable for grain at any time, as the yield is small.

Sheep on the Wheat Farm.

"I regard a flock of sheep as the cheapest, best, and most efficient agricultural implement a man can have on his farm. It works itself and pays the farmer for allowing it to work. It cleans up the fallow and weeds and fertilises the land at the rate of about 3 lb. of liquid and solid manure per day, adding the essential humus to the soil, and, in combination with a proper system of crop rotation, will bring so-called worked out lands to a high state of fertility."—H. V. Sprigg, Morphett Vale Branch, South Australian Agricultural Bureau.

Worms in Sheep.

Some Experiments in Treatment.

MAX HENRY, M.R.C.V.S., B.V.Sc., Government Veterinary Surgeon.

During the past two years various experiments have been carried out at the Glen Innes Experiment Farm in connection with the question of worm infestation of sheep. These experiments have been directed more particularly to elucidating points raised during previous years' work, and settling queries put to the Department by men interested in the work. These points will be taken in turn.

Alleged Danger to Man.

As to the possibility of arsenic-drenched sheep retaining sufficient arsenic in the carcase to act deleteriously on men eating such carcases, it was not considered by the veterinary officers that such a result could accrue; but as the point was raised in two different directions, it was thought to be desirable to experiment. The maximum dose usually given to sheep is 2 grains, and as only a portion of this is absorbed and is rapidly eliminated from the body, it is difficult to imagine how a sufficient quantity could be retained, even if the sheep were frequently dosed, to injuriously affect man. It seems probable that careless handling of the arsenic during preparation of the drench would be a more likely source of trouble connected with sheep drenching.

In order to ascertain whether ordinary dosing was likely to lead to any retention of arsenic in the system, a sheep was given weekly the usual dose (2 grains) for four weeks. He was slaughtered three days after the last dose, and the following viscera, viz., spleen, part of liver, part of wall of abdomen, kidney, and a piece of muscle from the hind-quarters, were forwarded to Mr. Guthrie, Chemist to the Agricultural Department, who reported that arsenic was tested for and found to be absent. This sheep had received 8 grains within one month, which is, of course, greatly in excess of what an animal would usually receive within the same period. No ill-effects were observed as far as the sheep was concerned.

Alleged Danger to the Sheep.

As has been mentioned in previous reports, stock-owners occasionally accuse the usual dose of arsenic—2 grains—of causing death even when properly prepared; and to test the likelihood of a small overdose causing death, the following experiment was carried out:—

Weaners received the following doses, viz.: $\frac{1}{2}$, $\frac{3}{4}$, 1, $1\frac{1}{2}$, and 2 grains.

Adult sheep received the following doses, viz.: 1, 2, 3, and 4 grains.

All sheep were starved for eighteen hours before dosing. In no instance was any ill effect observed. It is thus evident that sheep will tolerate much larger doses than those commonly given in practice, but whether this toleration is constant or not requires further proof.

Safety of Fumigating with Sulphur Fumes.

In previous reports, the fumigation of sheep with sulphur fumes for lung worm has been recommended. It has been observed, however, that if carried out

during unfavourable weather, and pushed too far, congestion of the lungs is likely to occur, and deaths from this cause have been noted. Experience gained this year shows that even ewes heavy in lamb may be safely fumigated with great advantage, provided the work is not performed in cold, bleak weather.

Fumigation was first carried out on the farm under my supervision ; but this year, when it became necessary, Mr. R. H. Gennys, the manager, conducted the work. He first queried the advisability of subjecting ewes heavy in lamb to the fumes, but was advised that no harm should accrue if care was taken. His report may be quoted as follows :—

All the sheep on the farm. . . . were fumigated for lung worm for eight to ten minutes, as advised by you. The coughing in all the drafts except one was considerable before letting out of fumigating shed. No deaths followed for about two weeks, when two died. One could not be examined ; and the other died from lambing. On opening the sheep immediately after death, there were no lung worms present. Although before fumigation sheep were constantly heard coughing, since the operation only two or three have been heard. The sheep, too, have improved in condition all round, and lambing is progressing satisfactorily, although feed is not so good as usual at this time of year.

* * * * * * *

I cannot see any evidence that the fumes injured the ewes in any way, but, on the contrary, a great improvement has taken place. The weaners that were done have improved at a great rate ; their feed up to now, however, was getting better.

It is always difficult, especially without controls and without some sacrifice by killing, and thorough examination by a veterinary surgeon, to arrive at the results of treatment ; but the almost total cessation of coughing, coupled with other favourable symptoms, leads me to a satisfactory conclusion as regards this fumigation. I think, however, that ten minutes should not be exceeded in a close apartment with thick fumes. The weather was favourable. and apparently no congestion supervened.

Later, Mr. Gennys reported :—

With respect to the fumigation just prior to lambing, the ewes seem to have quite lost their cough, and appearances point to 70 or 80 per cent. of lambs when finished. Two that died since I last wrote from lambing mishaps, however, contained some lung worms.

This result is considered highly satisfactory, and is again evidence that this method of dealing with lung worm in small flocks is well worthy of trial.

Efficacy of different Drenches for Stomach and Intestinal Worms.

It was recognised that, from a practical point of view, that result was most desirable which showed the greatest increase in weight in the growing lamb, and, consequently, two sets of experiments were conducted, in which lots of lambs kept under identical conditions, were treated in various ways, and their weights taken. It was known that they were more or less infested with worms, but whether they remained so or not was considered immaterial if only they added weight.

The results of the sets of experiments undertaken in 1910 and 1912 are given in the attached tables, and for comparison, the results of very similar tests, although carried out with rather a different object in view, in 1909, are given below :—

GLEN INNES EXPERIMENT FARM, 1909.

Average increase in Weight of Lambs, from 9th January to 24th September, in Experiments with Worm-infested Lambs.

Treatment.	Average increase.	Treatment.	Average increase.
	lb.		lb.
1. Introduced grasses ...	62¼	4. Licks	27½
2. Drench	28	5. Licks and drench ..	27 1/12
3. Controls	21⅓	6. Controls	27⅔

Glen Innes Experiment Farm, 1910.

Drenching Experiment with Worm infested Lambs.

Drench.	Average Weight per Lamb.					Result, Three Months after First Drenching.	Result, Three Months after Second Drenching	Final Result, Six Months from First Drenching.
	At First Drenching, 22nd February, 1910.	23rd March, 1910.	22nd April, 1910.	At Second Drenching, 24th May, 1910.	15th August, 1910.			
	lb.	lb.	lb.	lb	lb.			
Arsenic	48	42	46	48	44	Neither gain nor loss	Loss of 4 lb..	Loss of 4 lb.
Copper sulphate	45½	37	44½	46½	41½	Gain of 1 lb.... .	Loss of 5 lb..	Loss of 4 lb.
Proprietary drench ..	48½	41½	46½	48½	43½	Neither gain nor loss	Loss of 5 lb. .	Loss of 5 lb.
Creosote	50	45	45	46	42	Loss of 4 lb.... .	Loss of 4 lb..	Loss of 8 lb.
Controls (not drenched)..	51	45	48	49	48	Loss of 2 lb.... .	Loss of 1 lb. .	Loss of 3 lb.

Glen Innes Experiment Farm, 1912.

Drenching Experiment for Worms in Sheep.

Number.	Average Weights.														
	Drenched. 7/3/12.	Drenched. 13/4/12.	Increase.	Drenched. 9/5/12.	Increase.	7/6/12.	Increase.	10/7/12.	Increase.	9/8/12.	Increase.	6/9/12.	Increase.	9/10/12.	Increase.
Arsenic—Dose 1 grain.															
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
A 15*	55	64	9	64	9	66	11	47	−8	51	4	55	0	60	5
A 16*	54	65	11	64	10	63	9	41	−13	43	−11	...	...	54	0
A 33*	50	60	10	60	10	65	15	52	2	54	4	57	7	63	13
B 5	51	56	5	67	16	62	11	53	2	52	1	55	4	60	9
A 42	50	49	−1	45	−5	47	−3	43	−7	43	−7	48	−2	52	2
C 20	58	56	−2	60	2	64	6	50	−8	53	−5	56	−2	63	5
Average weight ...	53	58·3	5·3	60	7	61·16	8·16	47·6	−5·3	49·3	−3·6	54·2	1·75	58·6	6·8
Arsenic, 1 grain ; Magnesium sulphate, ½ oz.															
C 27*	55	66	11	67	12	67	12	56	1	60	5	62	7	69	14
B 37*	61	72	11	68	7	64	3	50	−11	52	−9	56	−5	66	5
C 41*	52	58	6	54	2	52	...	50	−2	50	−2	56	4	62	10
B 41	47	50	3	44	−3	60	13	51	4	53	6	58	11	62	15
B 31	54	56	2	60	6	63	9	53	−1	57	3	58	4	63	9
C 43	54	54	...	59	5	64	10	44	−10	47	−7	53	−1	60	6
Average weight ..	58·83	59·3	6·6	58·6	4·83	61·6	7·83	50·6	−3·16	53·16	−·6	57·16	3·3	63·6	9·83

Drenching Experiment for Worms in Sheep—*continued.*

Number.	Average Weight														
	Drenched. 7/3/12.	Drenched. 13/4/12.	Increase.	Drenched. 9/5/12.	Increase.	7/6/12.	Increase.	10/7/12.	Increase.	9/8/12.	Increase	6/9/12.	Increase.	9/10/12.	Increase.
Controls (not drenched).															
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
B 1*	68	74	6	77	9	78	10	66	−2	67	−1	70	2	72	4
B 8*	44	56	12	56	12	63	19	50	6	52	8	54	10	56	12
A 44*	52	61	9	62	10	63	11	51	−1	52	...	54	2	61	9
B 15*	55	65	10	66	11	74	19	56	1	58	3	68	13	66	11
C 57	60	60	...	66	6	68	8	53	−7	52	−8	55	−5	62	2
A 38	50	54	4	54	4	62	12	53	3	56	6	60	10	66	16
B 42	43	49	6	52	9	58	15	50	7	52	9	56	13	61	18
B 22	62	66	4	67	5	70	8	60	−2	61	−1	63	1	68	6
Average weight ...	54·25	60·625	7·28	62·5	8·25	67	12·75	54·875	·625	56 25	2·28	60	5·75	64	9·75

* Lambs on complete lick.

Proprietary Drenches.

No. 1, average weight...	52	57·8	3·5	55·6	3·6	57·6	5·6	48·6	−3·3	50	−2	53·3	2	60	8
,, 2, ,, ...	52	57·6	5·6	58·6	6·6	58	6	46·5	−5 5	48·3	−3·6	52·6	·6	59·5	7·5
,, 3, ,, ...	56·25	60·5	4·25	60·875	4·625	62·375	6·125	51·25	−5	53	−3·25	55·875	− 375	62·625	6·375

Conclusions.

These results are distinctly curious in one particular, *i.e.*, that in 1910 and 1912, with one exception, the controls—those which were not treated at all—did best. The one exception was a lot of lambs treated with arsenic and magnesium sulphate (Epsom salts).

Of the 1910 lot, Mr. Gennys, in reporting, says :—

The sheep in the above experiment were a poor-conditioned lot, and were apparently all suffering from worm troubles when first drenched, and they were run together under similar conditions all the time. When convenient they had a paddock to themselves, and at other times were run with sheep not in the experiments. They had a change of paddocks occasionally, but were kept off all introduced pastures and cultivation paddocks during the experimental period. They were all given plenty of salt all the time. The pasture was at times very innutritious.

These sheep received only two drenches during the year.

Referring to the 1912 lot, Mr. Gennys reports that during the winter they were fed, first on clover hay, at the rate of 1 lb. per head per day, later with silage, 1½ lb., and clover hay, ½ lb. About the middle of August the clover hay gave out, so cocky chaff and molasses were substituted for it. Hand-feeding ceased on 14th September. They were treated three times. Both years were extremely dry in the Glen Innes district, although in 1912 rain occurred in the winter, but growth is late in that district.

The difference in growth in lambs in a good and poor season may be noted by comparing these two lots with the 1909 lambs reared on the same farm, and which, with the exception of those on introduced pastures, did not receive artificial feed. Evidently drenching as ordinarily carried out—say, two or three times in the year—will stop or prevent mortality by preventing such an intense infestation as will kill the lambs from exhaustion, or will put a stop, by clearing out the worms temporarily, to those sudden outbreaks of mortality which so often occur; but it is yet not capable of putting growing sheep into such a worm free and healthy condition as will enable them to outstrip untreated lambs. Even when drenched six times in seven months, as in the 1909 experiment, lambs were only able to outstrip untreated controls to a limited extent, whereas untreated lambs on really superior feed outstripped the others by more than double their increase. In no way, apparently, is drenching, licking, &c., to be compared as a preventive against the ravages of worms to good feed ; and the use of drenches would appear to be confined to cases where the worms are causing symptoms of one kind or another to be evidenced.

Drenching is particularly useful in those cases of mortality due to worms, which occur at the beginning of the infestation, and which are due, not to the increasing poverty and anæmia which long-continued severe infestation brings about. Such an outbreak occurred on the farm during the past year, but promptly ended on the administration of an ordinary arsenic drench.

Effect of Calcium Phosphate as a Lick.

During previous years it had been the custom to provide sheep with a lick, and amongst the licks used was one of calcium phosphate, 5 parts;

sulphate of iron, 1 part; Liverpool salt, 40 parts. It was noted that the sheep on this lick did exceptionally well, and Mr. Gennys was much impressed by their appearance. It was, therefore, decided to try an experiment to note what actual effect the provision of calcium phosphate might have.

The sheep under treatment were accordingly divided into two lots, half of each lot of sheep being supplied with a lick as above, and the other half a lick of Liverpool salt 40 parts and sulphate of iron 1 part; without the calcium phosphate. The weights of the sheep were taken three times during the experiment, which, unfortunately, only lasted for three months, when owing to the droughty conditions, all the sheep had to be run together.

In the following table the weights of the sheep are given, those which received the calcium phosphate being placed under the heading of "Complete Lick"; the others under the heading of "Incomplete Lick." The superiority of the former to the latter is most constant, and as there were over twenty sheep in each section, it is fairly evident that individual characteristics may be eliminated.

GLEN INNES EXPERIMENT FARM.

Sheep Drenching for Worms.

AVERAGE increase or decrease of Lambs on Complete and Incomplete Lick at different weighings.

Drench.	7th March.		Average Increase. 13th April.		9th May.		7th June.	
	Complete Lick.	Incomplete Lick.	Complete Lick.	Incomplete Lick.	Complete Lick.	Incomplete Lick.	Complete Lick.	Incomplete Lick.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
(1) Proprietary drench ...	55·	50·5	10·	·3	8·5	1·25	10·5	3·25
(2) ,, ,, ...	51·6	52 3	7·6	3·6	8·	5·3	9·	3·
(3) ,, ,, ...	53·25	59·25	8·	·5	5·75	3·5	6·5	5·75
(4) Arsenic	53·	53·	10·	·6	9·6	4·3	11·6	4·6
(5) Arsenic and Mag. Sulph.	56·	51·6	9·3	2·5	7·	2·6	7·5	10·6
(6) Controls	54·75	53·75	9·25	4·6	10·5	6·	14·75	10·75

This is a valuable piece of evidence on a point of much importance to stock-owners generally, inasmuch as it shows that the deficiencies of our soils —and of these one of the most important is poverty in lime—can be remedied by artificial means. The fact should be noted in conjunction with the evidence shown in an article, by the writer, which recently appeared in the *Agricultural Gazette*, on "Osteo-Malacia in Cattle in New South Wales," in which the beneficial effects of bone-meal fed to cattle in licks were pointed out.

The Practical Use of Timbers.

CHAS. J. WOOLLETT, Stock Inspector, Cobar.

ALTHOUGH the following notes refer more particularly to western timbers, the principles enunciated apply nevertheless equally to the use of timbers from other districts. Before entering upon the subject proper we will give an elementary description of the structure of timber.

All trees that provide us with timber are outward growing trees—that is to say, they increase in girth by developing successive layers round the trunk next to the bark. Each year generally adds one of the layers or rings, and consequently they are called "annual rings." In addition to the annual ring, trees have medullary rays, which are thin and generally broken lines, radiating from the centre, or pith, to the bark, and *vice versâ*. These rays are not very apparent in some trees, but in dry cypress pine they are easily seen. Cabinetmakers call these rays the "silver grain."

The trunks and branches of trees consist of two kinds of wood—the hard, dead heartwood, or duramen, and the soft sapwood, or alburnum. The latter is much lighter in colour than the former.

The bark consists of an outer and inner layer.

It is through the sapwood that the root-sap is carried up to the leaves. Here chemical changes take place with the carbon that has been abstracted from the carbon dioxide of the air, which has found its way into the leaves by means of the breathing pores or stomata. After the various changes have taken place the "food sap" returns by means of the inner bark and passes through the medullary rays to nourish the tree.

Heartwood is much stronger and more durable than sapwood, and the outer portion of the heartwood is stronger than that near the centre, or pith, more particularly if the wood is "pipey," because then it has been subjected to decay and is very brittle.

Old wood is stronger, though lighter, than young wood. The strength of timber is influenced by the quality of soil on which it grows. Evenness of grain in the annual rings denotes strong wood. Localities subject to droughts produce faulty timber.

By strength of wood we mean the resistance it offers to force acting at right angles to its grain. This is called "transverse strength."

It must be patent to all that where the strongest parts of timber are preserved the structure built would have a much longer life than where the weaker tissues are made to stand the strain.

For stockyards, stables, huts, and the like, cypress pine (*Callitris* sp.) timber is generally used in this district, because it is practically the only timber of any size, and is much easier split and worked than the eucalypts and acacia.

Cypress pine is very fissile, but will stand very little transverse strain; and therefore, when using it, knowing of its weakness, workers should aim at conserving the strength in every possible way. Anyone familiar with pine used in stockyards knows that the rails most frequently break at or near the middle and at the tenon, which fits the mortise of the post. When pine saplings are used as rails the posts should be close together to lessen the strain when stock bump against the rails. Little or nothing but the bark should be removed from young pine in making a tenon, because the young wood is much weaker than that from mature trees, and by removing the harder heartwood of an already weak timber the strength and durability is very materially lessened.

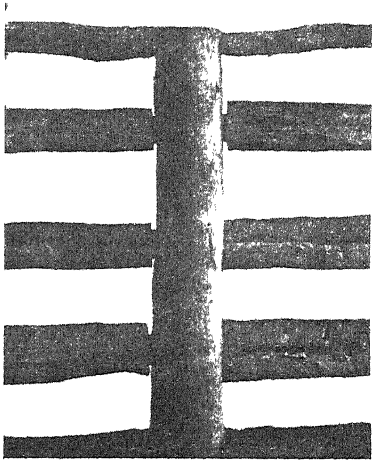


Fig. 1.

In Fig. 1 the stockyards are made of split pine. To the casual observer they appear to be very substantial and as strong as that timber will allow. Both the posts and rails are from mature and fairly sound trees. They are on a station belonging to a gentleman as keen, observant, and well informed on matters pertaining to agronomy as any person with whom the writer comes in contact. Yet, until the matter was discussed with him, although he was well aware of the characteristics of the timber, he had not given any thought to the reduction of the strength of these timbers when he allowed his men to cut them as they had done in making these yards.

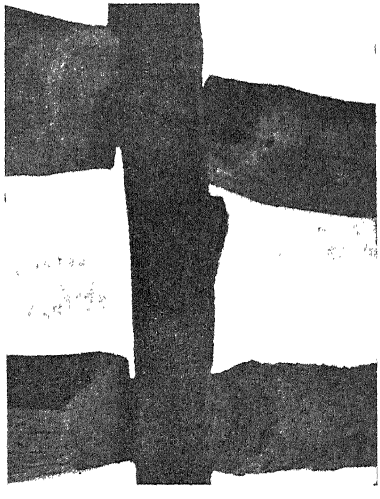


Fig. 2.

In Fig. 2 the photo is taken much closer to the posts and rails than Fig. 1, and from inside the yard.

The reader will observe that about half the rail has been cut away and a very small tenon left to fit the mortise of a very substantial post A chain is no stronger than its weakest link, and so here the strength of this fence depends on the strength of the

tenon. Furthermore, even the tenon has been weakened by adzing wood from the convex outer hardwood, instead of from the inner wood towards the vicinity of the pith. Obviously, to make the yards as strong as possible with this class of timber, much larger mortises should have been made in the posts, and there should have been no adzing from the rails.

Slabs of pine and old railway sleepers are frequently used as flooring for stables and cow-bails on farms and stations. At times they are not used to the best advantage, and consequently are heavy with the smell of urine, no matter how the attendant may try to keep the place clean.

Fig. 3 represents logs showing the rings plainly.

Now, if the logs were placed as in Fig. 3A, urine would find its way through the space of the rings when the logs were seasoned, and there set up decomposition, decay, and an objectionable odour. Obviously they should be set as in Fig. 3B.

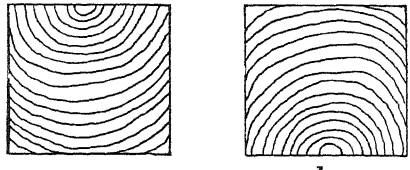


Fig. 3.

As milk absorbs odours very readily it is necessary that cow-bails should be as free from bad smells as possible. The same thing applies to the decking of bridges and culverts. If placed as in Fig. 3A, rain would find its way into the rings, and, when evaporated by the sun, would cause warping and, consequently, weakening of the timber for traffic.

Eucalypts are also used for building yards where strength is required, the best of which in this part are Coolabah (*Eucalyptus intertexta*) and bimbil box (*E. populifolia*). The timber of these trees is very hard, with short interlocked grain and most difficult to split. It is capable of standing a heavy transverse strain if fairly thick and not too long. Excellent bullock-yokes and waggon-poles are made from bimbil box.

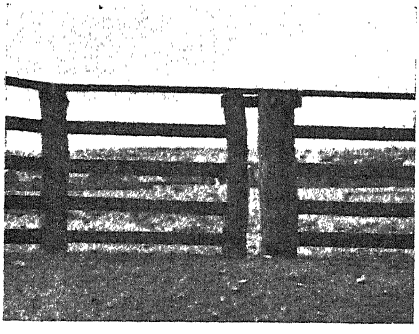


Fig. 4.

Fig. 4 is a picture of yards made of hardwood, which at first sight appear very substantial. Indeed, they are strong enough to hold sheep, goats, or quiet milch cows, but frequently fail to stem the rush of frightened cattle. The rails are of sawn timber of a short, curly grained hardwood and about $1\frac{1}{4}$ inches thick. They are much too narrow in comparison with their length. Being so narrow and long, they bend to only a moderate pressure upon their middles. To guard against the rails being forced out—which frequently happens—the mortises should be at least 2 inches deep; but, instead, they are only half that depth in the post.

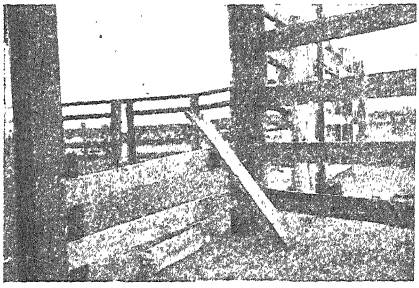


Fig. 5.

Fig. 5 shows how two rails gave way when a mob of cattle became frightened. These are comparatively new yards. Split timber is much stronger than sawn timber, and therefore for such purposes as stockyards the split hardwood is better than sawn, because the grain is not broken so often. Here strength has been sacrificed for neatness.

Fig. 6 is an example of using rails out of all proportion to the strength of the posts, and the former are also weakened by cutting away such a large amount for the tenon.

Attention to some of the points enumerated above, relating to the construction of stockyards, may avoid the annoying occurrences of wild stock breaking away at, say, branding-time, through a weak rail being broken by the animals in their caperings round the yard, to say nothing of loss through broken limbs when they essay to jump out of a yard through an opening left by a broken rail.

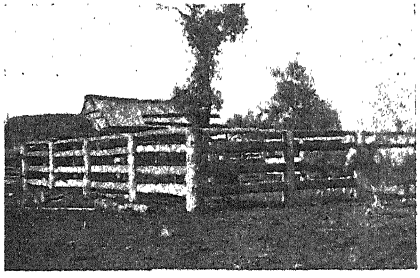


Fig. 6.

Frequency of "Heat" in Ewes.

At what intervals does a ewe come in season? This question was asked in a letter from the Northern Tableland.

The reply of the Sheep and Wool Expert was as follows: There is a great difference of opinion on this subject, but I may quote from "Veterinary Obstetrics," by George Fleming, a recognized authority on the subject:—

> The frequency and duration of the period of "heat" depends upon age, species, and other circumstances . . . . . The shortest duration is witnessed in the cow and sheep, and the longest in the bitch . . . . . With impregnation, however, it ordinarily ceases until after parturition; and if impregnation does not occur it gradually disappears until the next period, which is somewhat variable. In the sheep the period of "heat" lasts for one or two days, and again appears (comes in season) from the fifteenth to the thirtieth day, but usually every month.

It is evident that the intervals of "heat" in the sheep are rather variable, and not so definite as in the case of the mare or cow. Flockmasters usually have rams with ewes for six weeks, as during that period all the ewes not impregnated on their first coming into season will again exhibit "heat," and afford the rams another opportunity within the six weeks.

Wheat Crops at Nyngan Farm.

H. J. KELLY, Manager, Demonstration Farm.

TAKEN on the whole, the 1912 season at Nyngan was considerably drier than the average. Up to the 9th June only 54 points of rain had fallen and the hopes of harvesting any crops were very gloomy, as at that time none of the seed planted during the autumn had germinated, and it was considered that, with the usual light winter rainfall for the district, it would be too late for the growth of satisfactory crops.

However, on the date above mentioned splendid rains fell, and were followed up almost weekly until the end of August, when a total of 730 points had been registered.

A Dry Spell.

The extremely mild weather conditions were greatly in favour of wheat, and a heavy yield was then anticipated, but early in September very drying winds set in, and it was soon evident that unless good rains came at an early date a grain harvest was out of the question, and that the later maturing varieties were not going to prove satisfactory for hay.

No further rain having fallen, hay harvesting commenced on the 2nd October, and it was thought best to cut most of the crops for hay, leaving only sufficient for grain to provide for next year's planting.

Conspicuous Varieties.

In all 120 acres were harvested for hay, and yielded about 140 tons. Firbank again proved its suitability to the district as a hay wheat, yielding in some cases over 30 cwt. to the acre. Comeback and Steinwedel also gave fair results, but Bunyip, Warren, Bobs, and Federation were unsatisfactory.

In the commercial paddock 2½ acres of Firbank were left for grain, and produced 10 bushels 24 lb. per acre. In the experiment paddock Florence gave best results for both hay and grain, yielding on one plot at the rate of slightly over 2 tons 3 cwt. of hay and 15 bushels of grain per acre.

This last-named variety will be given an extended trial next year, and if it succeeds in wresting pride of place from Firbank, the risk of crop failures in the future will, provided proper methods be adopted, be greatly reduced.

Cultivation on Fallows.

In reviewing the past season's results, which were obtained on barely 50 per cent. of the average rainfall, a few striking features present themselves. In consequence of practically no rain falling after the middle of December, 1911, insufficient moisture was contained in the seed-bed to germinate grain, and no signs of moisture were visible to a depth of 8 inches. One would almost imagine that unfallowed land would, under such conditions, be equal

to fallowed land, but a mulching experiment being conducted at this farm plainly suggests something different. One of the plots had to be ploughed at the same time as the plots immediately beside it, but it was purposely left uncultivated during the summer until just prior to planting in April, while those alongside it were kept well cultivated and free from weeds. The uncultivated plot gave a hay yield of 19¼ cwt. to the acre, while the plot on one side yielded 32¼ cwt., and the plot on the other side 34½ cwt. per acre. Evidently, unless the soil is properly cultivated, profitable crops cannot be expected in any but the most favourable seasons.

Suitable Varieties and Light Seeding.

Again, suitable varieties should only be planted, for in adverse seasons only those varieties which possess drought resistant and early maturing qualities are likely to prove payable, and to attempt to grow unsuitable varieties is only courting failure.

Light seeding should also be strictly adhered to, for in the average season there is not sufficient moisture to bring a heavy seeding to maturity, whereas in fair seasons light seedings will prove sufficient for profitable crops, and less risk is taken should a dry season ensue.

Altogether the results obtained for the year are most encouraging, and assuredly point to the possibility of providing a reserve of fodder to assist in tiding over dry times.

A Fine Crop of Rape.

A striking picture on the farm during the early spring was a crop of 60 acres of rape, which owing to the dry autumn did not germinate until after the June rainfall. It then made rapid growth, and provided sufficient fodder for 600 sheep for two months. This is one of the best fodder crops that can be grown as a profitable alternative with wheat.

The "Grain Merchants' Ready Reckoner."

Mr. L. F. Broomhall, the compiler and publisher of the "Grain Merchants' Ready Reckoner," has issued a pocket edition of the work, the object of which is to make available in a form handy to the farmer the tables that are of special interest to him. With the assistance of these tables a farmer may ascertain from a given weight of wheat, maize, barley, or oats, the exact number of bushels it represents, so that he may know at once what are the bushel contents of a load or truck. It is also possible, from another table, to calculate the freight per bushel on either of these cereals where the rate varies from 1s. 6d. per ton to 15s. per ton—a range quite long enough for ordinary purposes in this State. Several other tables of interest and value to farmers are included. Published by L. F. Broomhall, Sydney. Price, 1s.

Yanco as a Dairying Proposition.

M. A. O'CALLAGHAN, Dairy Expert.

DAIRYING should be the main factor in the future welfare of the great bulk of the farmers who occupy land on the irrigation area in the neighbourhood of Yanco. I know of no better proposition for the young dairy farmer of limited means than that which has been, and is still being, offered by the State in connection with the settlement of the lands on the Northern Murrumbidgee Irrigation Area. I have recently made a close inspection of a representative part of this area, and am now convinced that under fair management a good income can be made there by dairy farming.

Factors for Consideration.

In making the above assertions the following factors have been duly considered :—

1. The ability of dairy cattle to thrive and give good returns under the climatic and other conditions prevailing.
2. The ability of the settler to provide a suitable food for the yielding of good butter returns by his cows.
3. The ability of the cow and the settler to produce butter-fat at a price which will enable competition with the outside world to be successfully carried on
4. The ability of the manufacturer to produce a first-class butter under the conditions which are likely to prevail on the area referred to.

We will now criticise in detail the different sections here classified

The Climatic Conditions.

We have ample evidence from the dairy cattle that have been stationed at the Experiment Farm at Yanco in support of the statement that dairy cows will give good returns under the climatic conditions prevailing on the Murrumbidgee Irrigation Area.

We have also a great deal of evidence available from dairy cows that are now being milked on the area referred to, but in addition to this I am able to state that cattle purchased on the South Coast, on the Hunter River, and in the Bega district of New South Wales, have done remarkably well when transferred to the dry climate at Yanco.

In connection with No. 1, we must consider the question of disease in relation to dairy cattle from the economic point of view, and it is an important point in favour of dairying on the Murrumbidgee Irrigation Area that animals stationed there should be, comparatively speaking, extremely free from those

diseases that are most common to our dairy districts. For instance, the climate is absolutely unfavourable to the development of tuberculosis, and in support of this statement I have only to say that during the past fourteen years we have been breeding dairy cattle on the Wagga Experiment Farm, mainly Jerseys, but some Ayrshires also, and I have never known a case of tuberculosis to develop on the Farm, although two at least of the original cattle brought from the coast to Wagga were affected by the disease, and th-refore acted as contacts, which should have been able, under favourable climatic conditions, to convey the disease to others in the herd. The cattle are annually tested with tuberculin, but no reactions have been obtained.

As the dry atmosphere and the bright sun common to the Yanco district are not favourable to the development of bacterial life, other contagious diseases besides tuberculosis should be, comparatively speaking, rarely met with in cattle depastured in that district ; and as strict precautions are being taken to prevent the introduction of diseased cattle and dairy cows on that area, it should, with a little foresight, be kept free from such diseases as contagious abortion, contagious mammitis, &c. We may assume, therefore, that financial losses through disease will be small when compared with many other dairy districts in New South Wales.

Production of Suitable Food.

We now come to the question of suitable food to enable the dairy cows on the irrigation area to produce a sufficient quantity of milk and butter to enable the proposition to be a sound financial one.

When I state that lucerne can be grown almost all over the irrigable portion of the area, little else need be said in support of the statement that suitable fodder for dairy cows can be provided.

In addition to lucerne, however, green maize should do remarkably well as a summer food, while the climate should be favourable to the growth of sorghum, barley, and oats for use in winter and spring as green fodder.

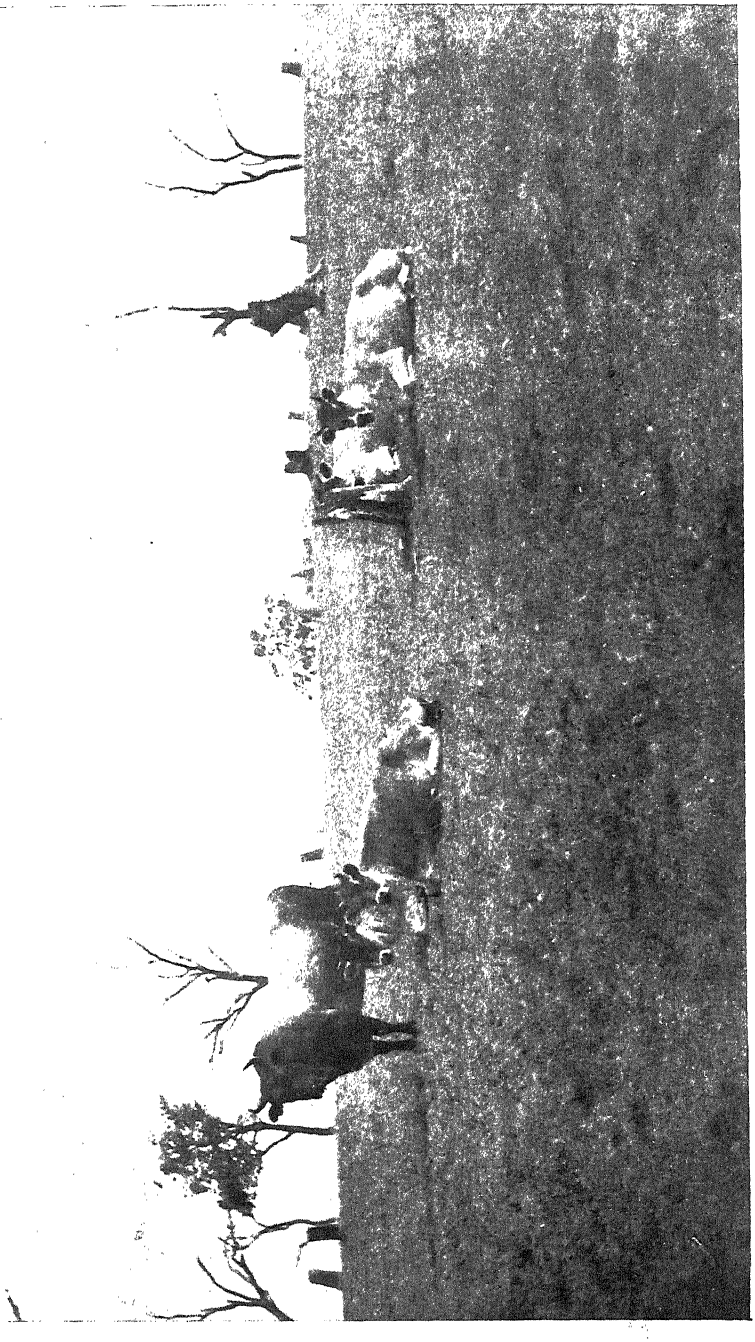
Cost of Production.

The most important point in the whole proposition is the question of first cost of the main article to be produced. This we will assume will be butter.

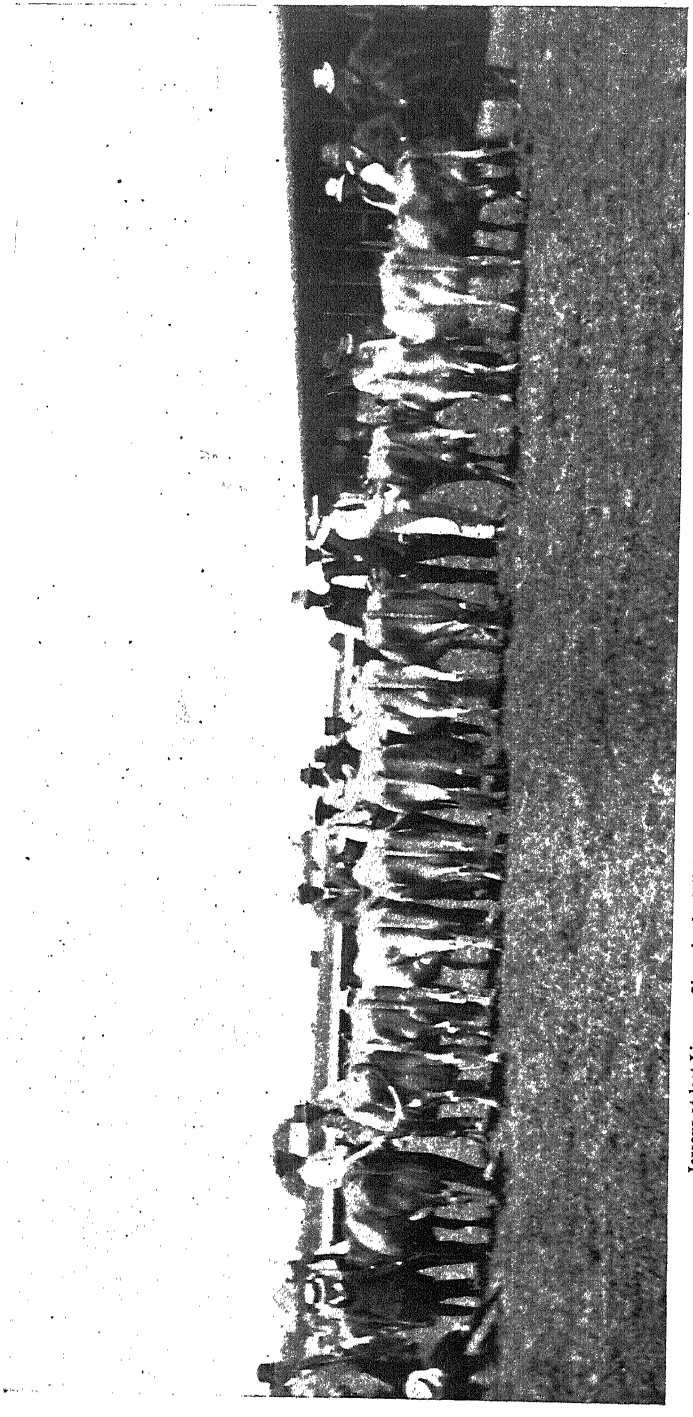
There will be no comfort in the knowledge that dairy cattle will thrive well and show good returns in milk and butter yields if those yields are produced at too great a cost, or at a cost that will not leave the farmer a fair remuneration for his labour.

In connection with this matter, we must consider that the district will be open to competition, practically speaking, from the outside world, because the butter produced there, or a main portion of it, will have to face all competitors on the British markets.

In dealing with this matter the question of labour has to be closely considered, and we may start right here by saying that it will not pay to put



Jerseys at Wagga Experiment Farm, the relatives of which are doing so well at Yanco Experiment Farm.



Jerseys at last Lismore Show in the Milking Cow class. Animals of this breed have done very well in the Yanco district.

labour into bad cows. Almost all the fodder which the animals will consume will probably be hand-fed, as farmers will probably find that it will not pay to graze their cattle on lucerne paddocks which have been irrigated, because the plant will generally be so succulent and moist as to be dangerous, by producing what is known as "hoven," or "blowing," in cattle; and, in the second place, the amount of food which the cows would trample, except immediately after a cutting, would be so great that the loss entailed would more than pay for the labour of cutting.

There is also another fact against the grazing of cattle on lucerne, and it is this: that for some days after the necessary flooding for irrigation purposes the cattle must perforce be kept off the irrigated portion, otherwise they sink into the soil and cut up the crop considerably. Hence it may be assumed that, as a general thing, the farmers will cut their lucerne, barley, and sorghum, and feed it to their cattle in due course. This cutting and hand-feeding means extra labour; but it also means extra good results, because the dairy cow under these conditions, with, practically speaking, permanent green fodder, should yield about a third more than she would do under the conditions generally prevailing in New South Wales, taking one year with another.

Reasons for High Yields.

In support of this statement it must be remembered that even a partial drought will seriously affect the milk yield for the year unless green fodder is available, because when a cow goes back in her milk through want of green fodder, she will not do herself justice during the remainder of the season, and hence the reason why the yields at Yanco should, as a general rule, be very much higher than the yields in our dairy districts. One point, however, which will be in favour of the labour available being made the most of, will be the fact that the areas will be small, and very little time will be wasted in getting to and from the immediate field of operations.

Herd-testing Association.

The main consideration, however, in lowering the cost of production is the standard of cows kept, and it might be stated straight away that there will be no room on the irrigated section of the Murrumbidgee Irrigation Area for inferior dairy cows. The very knowledge of this fact will make dairy farmers adopt special methods for finding out those cows that are worth keeping and those that are not, and in a district so closely settled as Yanco, the cost of maintaining a herd-testing association should be so small as to be an almost immaterial point in connection with the expenditure of a dairy farm.

To make the necessity for testing absolutely clear, we will take a simple illustration of two herds of cows. The average production per head of New South Wales dairy cattle may be put down at about 165 lb. of butter per year. If, as we might assume, this is worth 10d. per lb., it means that

each dairy cow brings in £6 17s. 6d. per year in butter production. The value of the separated milk should be added to this, and this amount may be put down at £1 5s., bringing the total up to £8 2s. 6d. per cow as gross earnings.

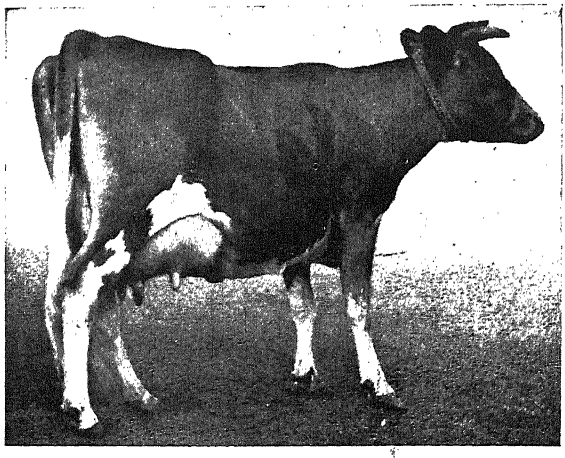
We will now take a herd of cows which would be only considered as very fair by good dairymen, and we will put their standard at 200 lb. of butter per annum, and this at 10d. per lb. comes to £8 3s. 8d., to which we add the value of the separated milk at £1 10s., bringing the total return to £9 13s. 8d. per cow, or a gain of £1 11s. 2d. per cow over the previous herd. As each dairy farmer with a block of 50 acres should have about 40 cows, the difference between the income of two farmers having herds of the standards referred to would amount to £62 6s. 8d. per annum; but a cow, even of the 200 lb. of butter standard, should be considered low under the conditions which we have been discussing, and the Yanco dairymen should aim at a standard of at least 250 lb. of butter per cow per year. This would mean a money value per cow of about £12 6s. in butter and separated milk per annum, or a difference of over £4 per cow compared with the average cow to which we referred at first.

We have an example of a Jersey heifer giving as much as 17¼ lb. of butter per week for six weeks at the Experiment Farm at Yanco, and this certainly goes to show that the climatic and fodder conditions are such as will enable cows to yield large quantities of butter-fat; hence, with green fodder available through the greater portion of the milking season, the butter yield per cow should be such as should pay for the cost of hand-feeding. If the cow is not up to the standard she should be sold and something of a better quality procured in her place. The Irrigation Commissioner has already done a lot towards helping settlers to procure and breed good dairy cattle, and no doubt this policy will be continued.

Rent and Interest.

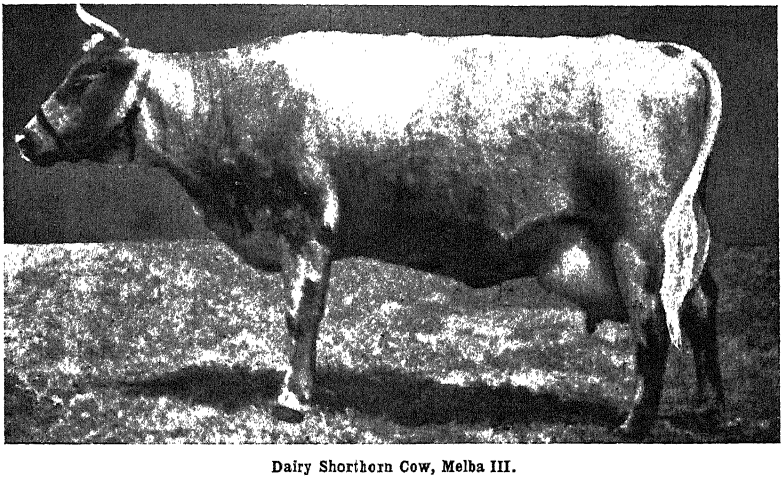
Next, in the question of cost, comes the annual rental and interest on money expended. We must look at this point on a comparative basis, and when we assume that 1 acre of irrigable land will easily maintain a cow, and that the rent for land and water comes to about 13s. per acre for such land, we have the fact established that 13s., plus cost of sowing, cutting, and feeding, represents the cost for fodder per cow per year.

On the ordinary dairy farm, if a man does not pay more than £2 per cow the way of rental or interest on money for the grass-land to carry the imal, he is doing well. Let us take the Richmond River for instance. A ntal of 30s. would be small for land which would sustain a cow per 1⅓ res, and here you have 40s. per cow expended straight away, without e cost of growing fodder for winter use, nor the cost of cutting same. The iry farmer can now best reckon for himself what it will cost him, provided has got labour in his own family, to cut and feed green fodder, mainly erne, to his dairy cattle on an irrigable area comprising 50 acres, and he



Guernsey Cow, Bel Air VI (imp.).

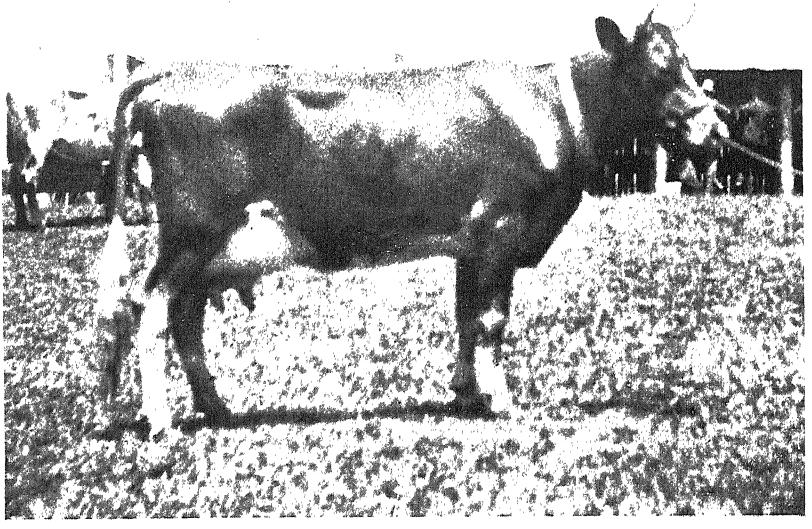
Dam of bull recently purchased by the Commissioner of Irrigation for the use of settlers at Yanco.



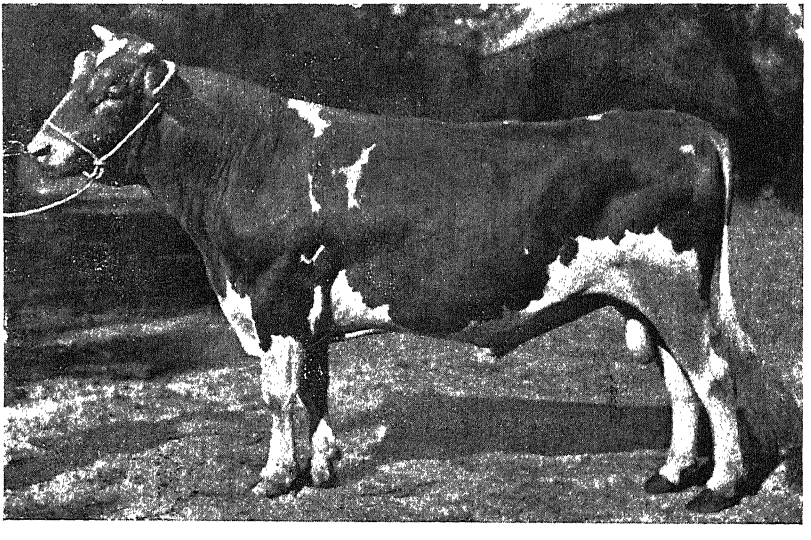
Dairy Shorthorn Cow, Melba III.

The property of Darbalara Estate.

TYPES OF DAIRY COWS SUITABLE FOR THE MURRUMBIDGEE IRRIGATION AREA.



Mr. Dixon Cooke's Champion Guernsey Cow.



The Government Guernsey Bull, Trengwainton Village Favorite (imp.).

will be able to see how the Yanco proposition compares with, say, dairy farming on the Richmond River, which is admittedly the most productive part of the State, if not of Australia, in respect to dairying.

Co-operative Effort.

There is little doubt that the milking machine will be brought largely into use later on, on the Yanco area, provided dairying makes that progress which it ought to, and there is no dairying district in Australia where a co-operative effort to reduce labour may be more easily and successfully made than on the farms closely adjoining one another on the Murrumbidgee Irrigation Area. There is no reason, for instance, why two farmers with 50-acre blocks should not establish common milking bails and utilise machinery for the purpose of milking, thereby saving a considerable amount in labour and leaving them more time at their disposal for the general superintendence of operations on their farms.

Similar co-operative steps may be taken in regard to other machinery, such as that necessary for the harvesting of lucerne hay, &c. A great feature in keeping the labour question within reasonable bounds on the Yanco area will be the permanence of the lucerne plant there, because this will prevent the necessity for the annual growing of other fodder crops to any large extent, and it may be taken for granted that lucerne will be a permanent plant at Yanco, because the lucerne which was sown there by Sir Samuel McCaughey some years ago is still flourishing, and when irrigated gives an excellent crop to-day.

The Quality of the Butter.

This brings us to the last, or fourth factor necessary for successful dairy farming at Yanco, and we have experience to guide us on this head.

At the butter factory at Hay, where the great bulk of the milk is produced from cows yielding cream similar to that which will be available at Yanco, a first-class butter has been made, and we also know that butters, which have brought high prices in London, have been manufactured on the Hunter River from the milk of cows fed, to a great extent, on lucerne.

The Yanco proposition will have everything in its favour in this respect, because an up to-date butter factory has been established, and it is so centrally situated that the cream or milk produced should be delivered without difficulty once a day. If this is done, or even a main portion of the cream is delivered once a day, it will enable it to be pasteurised, and a condition, therefore, obtained which will not only go towards doing away with any unpleasant odour, which may be temporarily caused by lucerne fodder, but it will also add to the keeping quality of the butter, and, therefore, to its value as an article suitable for export.

There is another factor which may possibly go towards success in connection with the manufacture of butter at Yanco, and that is that the various Government contracts for butter should be within the compass of such a

factory, and, therefore, commission, risk of bad debts, &c., on a large portion of the production should be saved. Dairy farmers may also feel fully assured that the Crown will pay them for all the butter their cream will produce, and hence there should be no over-run troubles.

Possible Developments.

It is calculated that when the Murrumbidgee Irrigation Area is in full swing there will be 350,000 acres of land to which water for irrigation purposes can be supplied. Taking a very low standard, we may assume that at least 200,000 acres of this will be devoted to dairying, and this latter area, together with the non-irrigated land which will be available for settlers, should easily support 200,000 cows. Calculating the gross revenue at £10 per cow, which, as I have already pointed out, will be a low standard of earning, we get an annual revenue of two millions per year for the people engaged in the industry.

Few people have had up to now any idea of what this irrigation area may mean to the dairying industry of Australia, but when the magnitude of its possibilities is pointed out, it will be seen that its encouragement and guidance is worthy of the very best efforts of the State. I consider that our dairy farmers have missed a good thing for their sons in so far as they have not been to any extent in touch with Yanco developments, but, no doubt, when the Mirrool country is being fully settled, our dairy farmers will take a larger interest therein than they have done in connection with the settlement of the lands immediately round Yanco.

Some people may think that I consider dairying will play a larger part in the settlement of this area than the facts up to date justify, but I am drawing my deductions from evidence available in connection with irrigated areas in other countries, and also from a very close personal examination of a considerable portion of the area under review. No doubt some people may be prejudiced against the taking up of land on the area, owing to the number of newspaper criticisms which have appeared recently, but, apart from the ordinary pin-pricks, which are, perhaps, not an unmixed evil in the development of any large and new enterprise, there is very little which the intending settler need worry his head about. True, probably, more money was expended in the erection of a few town houses than was necessary, but after the flea has bitten the camel there is a good deal of camel left.

Winter Fodder Trials, Wollongbar Experiment Farm.

J. G. McMILLAN, Manager.

[NOTE.—The Experiments Supervision Committee desires to warn farmers that the following report contains the results of one year's trials only. While farmers are entitled to know the results of the Department's experiments as they become available, no definite conclusions should be drawn from one year's trials.—ED.]

1. GRAZING TRIAL.

IN the Richmond River district during the winter months of the year the pastures are lacking considerably in milk-producing qualities. It was therefore decided, in 1911, to make trials of certain crops which would provide a succulent feed as a supplement to dry pasture, particularly during the months of June, July and August. The crops selected for the purpose were Black Winter rye, Thew wheat, Medeah wheat, Cape barley, and Algerian oats. In addition to each of these being sown separately, each class of grain had a plot allotted to it with the following legumes:—Black vetches, Grey field peas, and Red clover.

One-sixth of an acre was allotted to each plot, there being twenty plots in all. As fertiliser, superphosphate was applied at the rate of 84 lb. per acre. The plots were planted on 4th May.

The trial, in addition to ascertaining the yield of feed per acre, was also intended as a test to prove how the different cereals would withstand cows grazing upon them. It was, however, impossible to do both with the same plots, so, for the purpose of ascertaining the grazing qualities, areas of the cereals mentioned were sown in an adjoining paddock and cows depastured thereon. On the other plots the most profitable crop was ascertained.

The yields were as follows:—

No.	Crop.	Yield of Green Feed per Acre.			
		tons	cwt.	qrs.	lb.
1	Thew wheat	5	13	1	21
2	Medeah wheat	6	19	1	13
3	Algerian oats	6	5	2	17
4	Black Winter rye	10	13	3	18
5	Cape barley	7	4	0	15
6	Thew wheat and Red clover	6	3	0	18
7	Medeah wheat ,, ...	7	9	0	10
8	Algerian oats ,, ...	4	17	0	26
9	Black Winter rye ,, ...	9	3	0	13
10	Cape barley ,, ...	4	14	0	2
11	Thew wheat and Grey field peas	6	16	0	17
12	Medeah wheat ,, ...	8	0	1	5

The Yields—*continued.*

No.	Crop.	Yield of Green Feed per Acre.			
		tons	cwt.	qrs.	lb.
13	Algerian oats and Grey field peas	5	12	3	21
14	Black Winter rye ,, ...	11	2	0	1
15	Cape barley ,, ...	6	16	0	17
16	Thew wheat and Black vetches	6	16	0	17
17	Medeah wheat ,, ...	7	17	0	5
18	Algerian wheat ,, ...	4	9	0	26
19	Black Winter rye ,, ...	7	10	2	22
20	Cape barley ,, ...	4	9	1	1

The first crop to be cut was the Thew wheat, on the 6th September, the Medeah wheat and oats being last to be harvested, exactly three weeks later. The crops were favoured with a good rainfall in June and July. The Medeah wheat grew the most rapidly in the early stages, but was gradually outgrown by the Thew; however, the former wheat, being three weeks longer in maturing, ultimately beat the Thew in height and yield. A considerable number of farmers and visitors inspected the crops, and were very favourably impressed with the plots, the Thew wheat being the most favourably commented upon, as to all appearances being the heaviest yielder. The actual results, however, show how easily the eye can be deceived.

Remarks on Crops.

1. *Thew Wheat.*—A nice even crop, being about 5 feet in height, ears large and plentiful. Free from rust.

2. *Medeah Wheat.*—A fine crop, lighter in colour than Thew, average height, 5 feet 6 inches. Free from rust.

3. *Algerian Oats.*—A rather stunted appearance, stooled out well, rather inclined to rust. It is found that where rust is first noticed on this crop, if it be grazed off by cows, the second crop is practically free from rust.

4. *Black Winter Rye.*—A beautiful crop, surpassing any of the others in colour, which was a lovely dark green, with absolutely no sign of rust; stooled out excellently, giving a thick mat of feed.

5. *Cape Barley.*—This crop was affected with rust, but stooled out fairly well; the quality of the feed was poor and not to be recommended; patchy.

6, 7, 8, 9, 10.—The same remarks as to Nos. 1, 2, 3, 4, and 5 respectively. The Red Clover failed to grow.

11. The *Thew and Peas* proved a crop of good quality, and very even. Free from rust.

12. The *Medeah and Peas* also proved satisfactory, producing a heavy yield of succulent feed; average height, 5 feet 6 inches.

13. The *Algerian Oats* beside the other crops was insignificant in appearance, and showed a tendency to rust.

14. *Black Winter Rye and Peas* surpassed everything else, having every quality to recommend it as the fodder *par excellence.*

15. *Cape Barley and Peas* were stunted looking, colour bad, being affected slightly with rust.

16. *Thew Wheat and Vetches*, of nice appearance, and a crop to be recommended for cutting and giving as green feed.

17. *Medeah Wheat and Vetches.*—Very even crop of splendid appearance, giving a good yield of well balanced fodder. Eminently adapted for cutting and feeding to cows in stalls.

18. *Algerian Oats and Vetches.*—Rather stunted in appearance, stooled out well; slightly rusted.

19. *Black Winter Rye and Vetches.*—This crop was a very patchy one, part of the plot having a very poor growth, evidently due to a bad pocket in the soil.

20. *Cape Barley and Vetches.*—Generally speaking a poor crop, rusty, uneven; part of plot had practically no crop, evidently due to same cause as in No. 19.

As previously mentioned, an area was sown with the two wheats, Thew and Medeah, also with rye, barley, and oats, and the cows depastured thereon, a careful note being taken of how each crop withstood the grazing.

Thew and Medeah wheats are easily pulled out of the ground; cows do not relish either, and there is considerable waste. Both varieties will not even withstand one grazing. Not to be recommended for the purpose.

Algerian Oats withstand grazing, and benefit from such practice, rust being seemingly checked in the second growth.

Cape Barley is suitable for grazing, but owing to susceptibility to rust is not to be recommended.

Black Winter Rye is a good yielder, stands a large amount of grazing, and can be eaten off at least six times. It is not advisable to let this crop come into ear. When cows were transferred from silage feeding to the rye, the rise in milk was very perceptible, averaging from 3 to 4 lb. a cow per day. This crop can be sown in April, and will be fit for grazing in about six weeks' time, just at the period when green feed is most desirable. Although the result of the mixture of rye and vetches does not show so heavy as with field peas, owing to a bad patch in the plot, still, as a grazing plant, we would recommend vetches before peas.

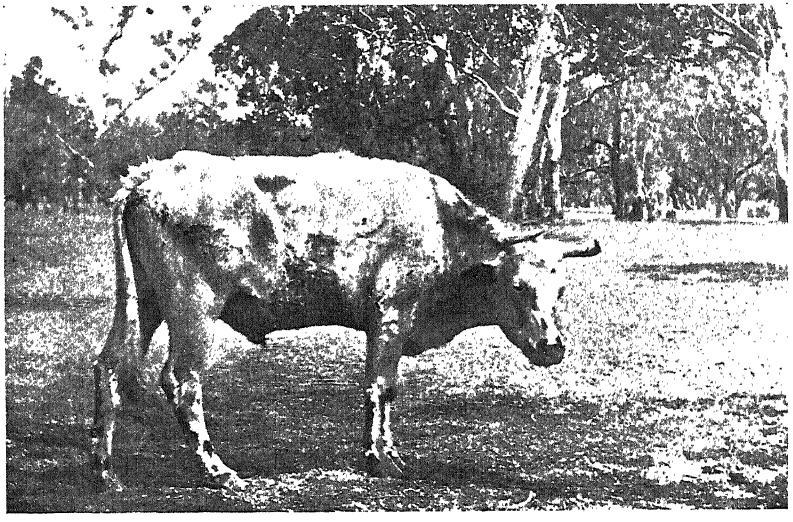
As an example of what might be done with rye and field peas or vetches on a dairy farm carrying, say, sixty cows, if 12 acres of this mixed crop were planted, and on the assumption that the yield of green feed was the same as in the case of plot 14, the total weight would be 133 tons 4 cwt. Allowing that the cows were to receive a ration of 60 lb. each per day, in addition to pasture, the period of time that the 12 acres would last the sixty cows would be eighty-two days, or nearly twelve weeks. Assuming that the yield of each cow was increased by 2 lb. of milk per day, it would be equal to 12 gallons amongst the sixty cows, and in the eighty-two days 984 gallons, which, at 5d. per gallon, would have a total value of £20 10s. As the cost of ploughing, manuring, and harrowing should not exceed £1 per acre, and as no hand-feeding is entailed, everything points to rye and vetches being the ideal feed for the Richmond River District.

2. WINTER FODDER VARIETY TRIAL.

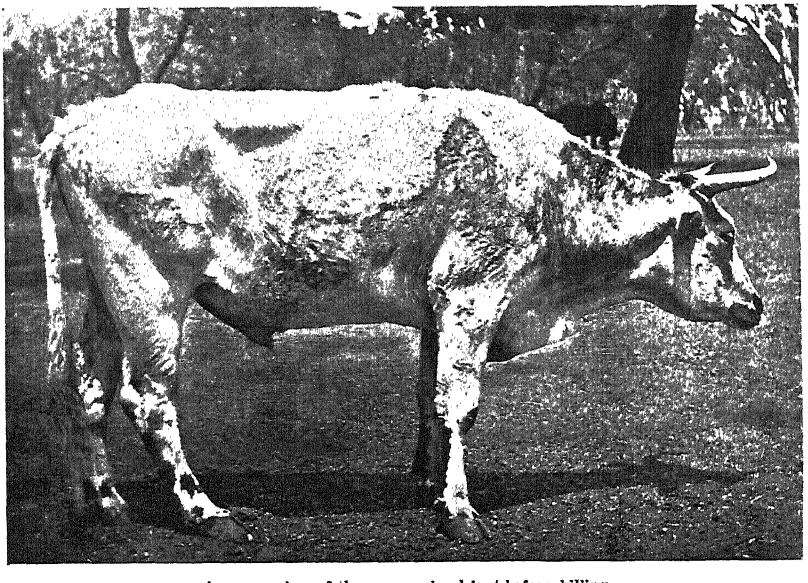
Object.—To ascertain what variety of cereal would give the greatest yield of green feed, Thew wheat being the check, all cut at milky stage and made into hay.

Variety of Crop.	Yield per Acre (Green).	Remarks.
	t. c. qr. lb.	
1. Thew wheat ... (*check*).	6 0 2 15	Nice even crop; average height 5 feet; free from rust.
2. John Brown wheat.	5 11 2 15	Stooled out well, but did not grow high; free from rust; slow maturing, being three weeks behind Thew.
3. Bobs wheat ...	6 0 2 15	Stooled well; average height 3 feet; free from rust; growth rather irregular; much later than Thew in maturing.
4. Thew wheat .. (*check*).	5 11 2 15	Almost same as No. 1; only one bad patch, evidently due to bad piece of ground.
5. Warren wheat	5 13 1 15	Nice even crop; well stooled; beautiful dark green colour; free from rust.
6. Medeah wheat	6 2 1 19	An excellent crop; average height 5 feet 6 inches; even; free from rust.
7. Thew wheat ... (*check*).	6 13 0 15	Even crop; free from rust.
8. Huguenot wheat.	4 13 3 3	The only wheat that showed rust; appearance poor.
9. Potato oats ...	.....	Entirely destroyed by rust.
10. Thew wheat ... (*check*).	5 4 2 7	Fairly even crop; although next to a rusty crop, showed no tendency to develop the disease.
11. Algerian oats...	6 2 1 10	A fairly thick mass of feed, but did not grow to a great height; slightly rusted.
12. Cape barley ...	5 0 1 27	Well stooled, but growth poor; did not appear at all a palatable feed.
13. Thew wheat ... (*check*).	5 11 2 17	The wheat having shown great heads of grain in this plot, after the weight was ascertained it was decided to see how much grain could be obtained. Owing to the ravages of the birds, however, the plot had to be cut before the grain was thoroughly matured. If damage by pests could have been prevented, the yield of grain would have been exceptionally high.
14. Mammoth rye	6 14 3 19	A fine class of green feed; thickly stooled; free from rust.
15. Black winter rye	8 5 1 9	As in the grazing trials, this feed outshone all the others.
16. Thew wheat ... (*check*).	5 15 0 23	A good even crop; free from rust.

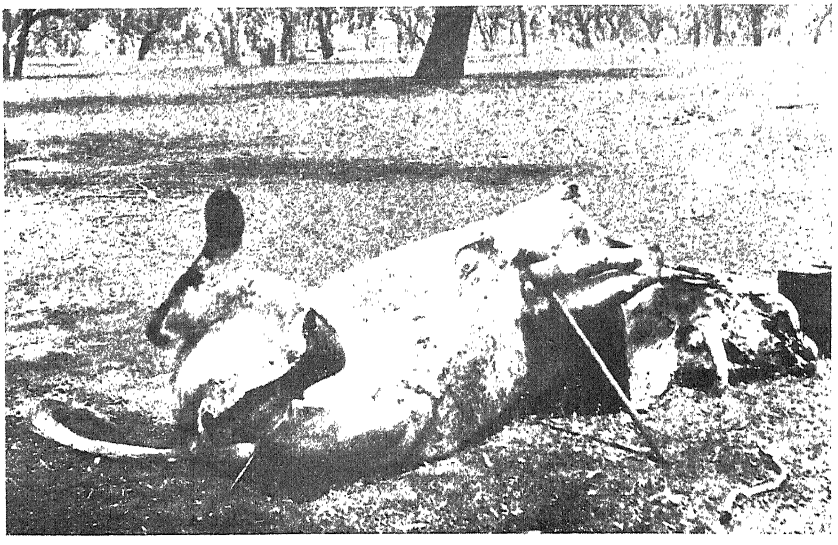
The quality of the hay obtained from most of these wheats points out that chaff pretty well equal to that obtained from other parts of the State can be made. It is a matter that might be given attention by Northern River farmers as an adjunct to dairy farming, there being a great demand for chaff in the district. Care, good judgment, and a reasonable period of dry weather only are required to produce a first-class article, which would probably prove more remunerative than dairying. Even if the weather conditions were opposed to the making of good hay, such cereals as those under review would make excellent silage.



A Bullock in an attitude characteristic of pleuro-pneumonia in an advanced stage.



A nearer view of the same animal just before killing.



The carcase ready for *post mortem* examination.



The carcase after the removal of the hind part and contents of the abdomen.

Contagious Pleuro-Pneumonia.

[The following series of photographs, together with the notes thereon, was forwarded by Mr. H. A. Flood, Stock Inspector at Moree, to Mr. S. T. D. Symons, Chief Inspector of Stock, by whom they were made available for publication.]

THE highly contagious nature of pleuro-pneumonia, and the fact that treatment for it is useless, make it a matter of importance to stock-owners that they should be familiar with the appearance of affected animals, and also with the measures that are taken for its control in the herd. The following notes, together with the accompanying photographs, are designed to indicate the appearance of a badly-infected beast, and, further, to assist stock-owners in procuring the virus with which animals apparently healthy must be inoculated.

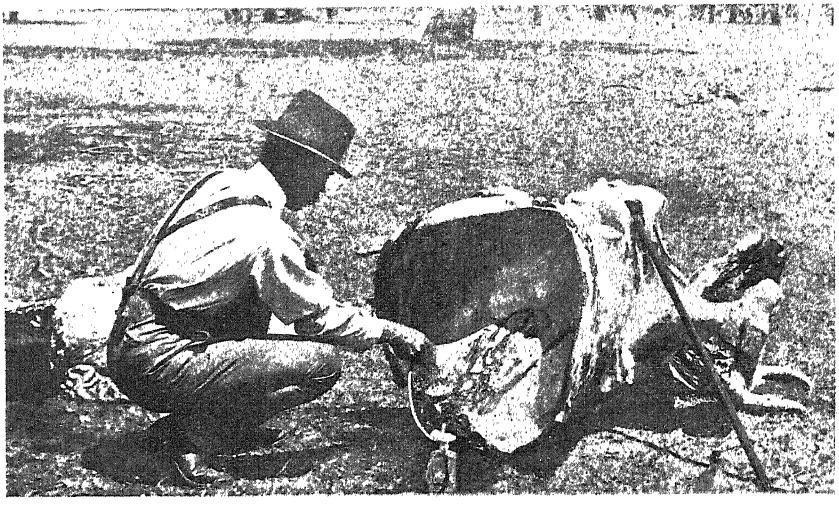
As the following plates show, the bullock, which was operated on in the case illustrated, was in a very bad state. Its appearance, as it was photographed just before it was killed—head down, fore-legs apart, eyes running, ears drooping, general emaciation, and staring coat—all prepared one for the condition subsequently disclosed by the *post-mortem* examination. These conditions are always in evidence in advanced cases, and when cattle are seen in a paddock, standing alone under shades or round water with this appearance, a person can say almost without any doubt that pleuro is the trouble. Nothing can be absolutely guaranteed until a *post-mortem* examination is made, however, as the exposure of the internal organs often shows that the outward symptoms are misleading, and although symptoms may point to a certain disease when the case is properly investigated, something quite away from what was originally suspected is often the trouble. Investigations, therefore, cannot be too searching or careful.

Although these are good plates of advanced pleuro-pneumonia, there are previous symptoms which should put owners on the alert before this stage is reached, such as coughing, and separating from the mob, and a peculiar appearance which distinguishes a sick animal from sound ones almost at once. A painful grunt also very often accompanies the breathing. As this disease accounts for many thousands of pounds' worth of cattle annually, as soon as there is any evidence of sickness the most evident case should b shot, and examined, as well as possible, to settle any doubt and if there are signs of disease, the matter should be reported to the proper authorities a once, so that an early check can be put to the outbreak. On the other hand, if the case is left until it is as glaring as the one illustrated, the owner must necessarily expect to be a heavy loser, as the spread of disease has been encouraged, instead of checked.

In the third photograph, the animal, after being shot and carefully bled, has been placed on its back, ready for *post mortem* examination. It should be handled very carefully, so that nothing will be broken or disturbed inside to mislead the operator in his investigation.

After the removal of the hind portion and contents of the abdominal cavity (stomachs, intestines, liver, &c.), the carcase presents the appearance shown in the fourth photograph. The fore portion can then be turned away to a clean spot, in a good light, and all traces of blood and dirt washed off, before proceeding to take the virus. The position of the virus can be detected by an expert almost at once, if immediately inside the diaphragm (the wall of fleshy membrane which separates the lungs and heart from the stomach), as it cups out against this pliable wall, and if it is in a deep-seated cavity it can be located by sounding from the outside.

The fifth plate gives an idea of how the virus can be taken without exposing it in any way to the outside conditions.

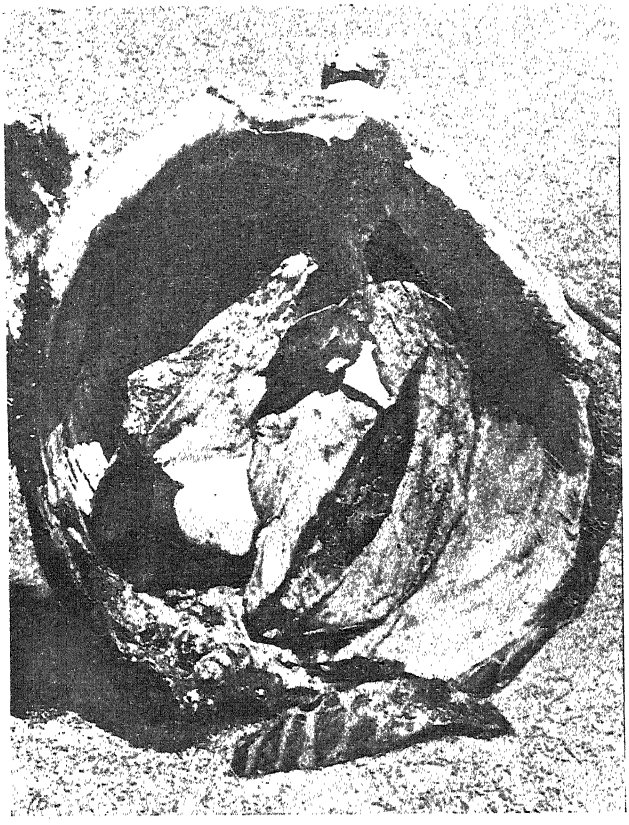


Taking the Virus.

The operator requires a clear glass bottle, with a sterilised cotton wool plug in it, a cork, about 6 feet of rubber tubing to fit a fair sized trocar and cannula : all the implements to be well sterilised. The instrument is thrust quickly into the cavity, where the operator is satisfied the virus lies, and a little of the virus is allowed to flow to clear the cannula. Then place the tube on the cannula, allow some virus to flow through it also, for the same reason, then light the cotton wool plug, and insert the tube in the bottle through the flame, which should be extinguished when about half the wool is burned, thus still leaving a plug round the tube, the tube being squeezed while being inserted to prevent virus running on to the wool. Allow the bottle to fill almost up to the plug, withdraw the tube, again light the cotton wool, and cork the bottle in the flame. Seal as soon as possible after, and keep in a cool, dark place. Very often the virus is found to be dark and evil-smelling ; this should on no account be used for inoculating—in fact, no virus should be used unless it is a good amber colour.

After it is taken the animal should be subjected to a most searching examination, to see if it is free from any other of the communicable diseases, more especially tuberculosis. If any of them are found, the whole of the virus should at once be destroyed with the carcase.

Too much stress cannot be laid on the importance of the care that should be taken with the taking of virus in the country districts. No person should dare take it unless he is absolutely competent to differentiate between the

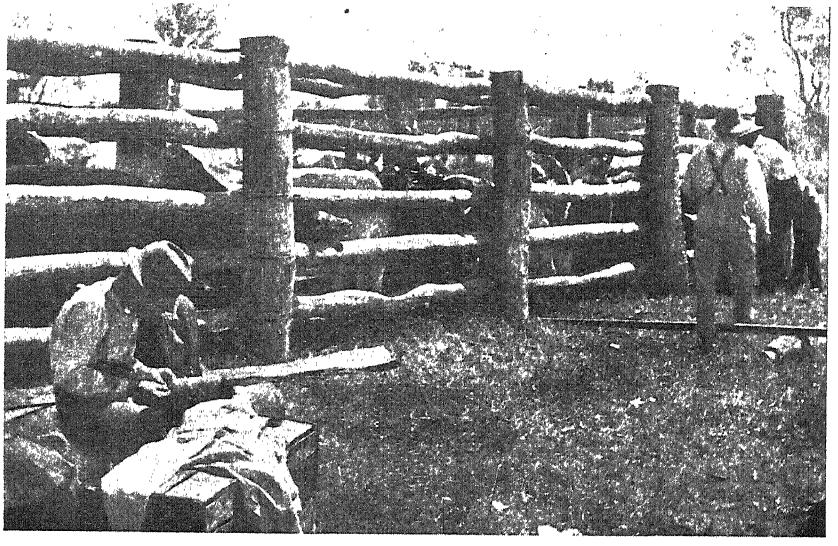


The lungs, greatly involved with the disease. Portion of one of the lungs has been removed, and can be seen lying on the ground at the bottom of the picture.

different diseases, nor should an owner allow an employee to do this work unless he is very sure that such person is thoroughly competent. If the greatest care is not exercised, which I am sorry to say occurs in very many cases in the bush, owners can easily realise why so many so-called "lumpies" appear from time to time in herds which, under the open dry conditions of the interior, should be very healthy. These "lumpies," in my opinion, are in a very large measure due to the actual inoculation of fine healthy cattle with contaminated virus.

For instance, if a bullock is opened, and found to contain a good supply of amber-colored virus, and the lungs are both greatly involved with pleuro-pneumonia, and intermixed with this abnormal condition there is tuberculosis of long standing, probably inundated with virus, &c., can the man with only station experience be expected to peer sufficiently far into the case to find this latter trouble; or, further, can he be expected to go through the glands, &c., in order to find out if the animal is free from any of the other communicable diseases?

In spite of this grave danger, stock-owners still allow this kind of thing to continue, and although the toll they pay is a heavy one, they seem to prefer the old careless bush style, to the careful, safe, and properly-guarded



Boy threading needles to be used in the inoculation of cattle.

method of the Stock Department. Bulls, cows, and, in fact, every class of cattle are put through together in this way, and while such unguarded work is carried on, these other diseases will be spread.

The virus, when taken, must be looked upon in the same light as an egg. If the latter is kept long, it will not hatch; and if the virus is kept long, although it may be perfectly preserved, it will not give the results that freshly-taken virus would do. In fact, virus which is taken from a beast should be used at once if possible, and on no account should it be kept fo. more than a few days. It should always be kept in a cool, dark place.

The photograph of the lungs shows they are greatly involved with the disease, and explains why the animal stands with legs apart, head down, and does not walk about any more than possible. The slightest movement or pressure on these huge masses causes the animal great pain

and distress. The plate shows that a section of lung has been removed, and is lying on the ground at the bottom of the plate. The weight of this pair of lungs was 80 lb., while the normal weight would have been from 6 lb. to 7 lb. The huge mass of diseased lungs is very inflamed, hot, and often in the last stages very gangrenous.

In the seventh picture a boy is seen threading needles for the operator, and a man carrying the threaded needle to him. This part of the treatment of pleuro is also regarded very casually by owners, although it is one of the vitally-important factors in the checking of the disease. The conditions under which the actual work of inoculating is done is in most cases very careless, and often filthy.



Inoculating cattle against pleuro-pneumonia. The operator is just about to insert the needle in the tail.

Owners should realise that they are using a very delicate serum on valuable stock, and that unless this delicate medium is given every possible chance to set up immunity, their work, and the knocking about of the cattle, will all be for no good. The threader should not touch anything but the work of threading, and should have his hands absolutely clean. He must also see that the needles are cleaned before re-threading, and he should do the work under a cool shade, and away from dust and heat.

A number of needles should be used, according to the size of the crush. Half should be carefully threaded, and placed on an enamel plate, over which is a light frame, to keep the damp cloth which goes over it away from the setons. This should be carried to the operator, who will take one out at a time, and immediately inoculate a beast with it. As soon as the number of needles on this plate have been used they should be returned to the threader, who should have the other half of the needles ready on another plate, and in this way freshly-threaded needles, under a cool dustproof cloth, are always at the operator's hand, and the virus is inoculated into the animal in clean condition, which gives it a chance of doing what is hoped of it.

The last plate shows the operator just about to insert into the tail the needle which carries the seton. In doing this work, a man should go ahead of the operator, take the tails out of the crush, and separate the hair enough to show the extreme end of the tail, and about an inch of the cartilage, and hand it to the operator, who grasps the brush, places the thumb of his left hand on the end of the cartilage, which he uses as a guide, and inserts the seton about half an inch above his thumb.

Bad tails are often met with, and they are largely due to using virus which contains foreign organisms and blood. The work of inoculating should not be slummed, and a good crush, strong, and not more than 2 feet 4 inches inside measurement at bottom, is a very necessary item.

All sick animals should be immediately isolated, and any showing distinct symptoms of disease should be destroyed, as old recovered cases are often the cause of starting a fresh outbreak that costs more than the value of the animal which was allowed to live, instead of being destroyed in the first place.

Lice-Infested Pony.

A Tamworth farmer, during December, sent to the Government Entomologist specimen lice which were got off a pony, and asked how he should get rid of them. He had already sprayed the pony with a non-poisonous sheep dip.

The lice proved to be *Hæmatopinus asini*, which frequent the horse and the ass, and are related to those that attack cattle and human beings. They are sucking lice, and are readily destroyed by applications of carbolic soap, tobacco infusion, kerosene and lard, kerosene emulsion, mercurial ointment, &c. The sheep dip used might prove quite effective. Careful grooming alone has a cleansing effect.

Comparison of Breeds of Poultry.

Monthly Laying Averages at Wagga Experiment Farm.

A. L. WYNDHAM, Poultryman.

These averages are compiled from the daily number of eggs laid and the daily count of fowls in each yard. Broody hens are allowed for, a week or ten days in each case. Pullets are included in the daily number once they start laying.

Although the yearly averages of egg production from the breeds of fowls kept are so much on a par as to be hardly worth comment, perusal of the averages will indicate the suitability of the Wyandottes for the dry, hot period, December to March. The Orpingtons lead in May and June, when cold, wet weather is generally experienced, and the Leghorns lead in the moist, warm to hot months of August to November. The Orpington's production of eggs during the March to June period exceeds that of the Leghorn by 28 per cent., and thereby adds materially to its earning power during the dear egg months. The Orpingtons suffer most from the extreme heat in summer. Through the extra dry conditions prevailing here from January to May in this year, the egg production of the Leghorns and Orpingtons was below the average of the Wyandottes.

From the writer's observations, the Silver-laced Wyandottes require the least food of any of the breeds mentioned. Although we incline to the opinion that the size of eggs is a matter to be settled by selection of hens for breeding, and by the use of second-year hens for the pen, the Wyandotte's eggs run slightly on the smaller side.

No deteriorating effect on the laying powers of the various breeds, by the introduction of fresh cocks of different blood, has been noticed. The additions were as follow, during the four years:—Black Orpingtons, 2; White Wyandottes, 1; White Leghorns, 3; Silver-laced Wyandottes, 3.

The cost of feed is, at the time of writing, under 1d. per fowl per week. The cost of attendance, at full estimate, is 1d. per week for each bird.

Feeding.

Our egg yield is obtained on two feeds per diem. Pollard and bran, or bread-scraps and bran, with an occasional variation to Sunlight oil-cake in lieu of bran, is the morning feed. Wheat is the only grain supplied in the evening. We use a pint measure to every six fowls for both morning and evening feeds, and pay a second visit to each pen when feeding to ensure the correct amount being given.

Bullocks' livers and meat-scraps are the only form of meat now used. Previously raw or green bone was ground up twice a week for the fowls, but we are securing quite as good results by using the meat as mentioned, and supplying the ashes from any old bones burnt up at intervals.

Green food is supplied daily, and chaffed to save waste, as the pens are quite bare. This includes anything from lucerne to saltbush, with perhaps waste apples in the summer time. We find laying hens give the best yields on a constant but light supply of green stuff.

The number of hens kept in one yard averages about twenty. We estimate returns would be better with an average number of twelve hens running together. Pen or yard measurements are 66 feet x 33 feet.

There is little protection against wind in our yards, and difficulty is experienced in keeping the ground of the laying pens in a fairly soft condition.

MONTHLY Laying Averages of the four breeds of fowls at Wagga Farm for the last four years.

Breed.	Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Average eggs laid per bird each year.
Black Orpington	1909	...	...	...	...	...	14	8	16	18	14	10	13	...
	1910	6	7	14	4	2	6	14	12	16	20	17	15	...
	1911	21	15	13	9	11	14	17	16	18	18	14	14	...
	1912	10	7	9	8	10	7	10	15	16	...	...	...	...
Average ..	...	12	9	12	7	11	10	12	15	17	17	14	14	150
White Wyandotte.	1909	...	...	...	...	10	14	13	16	18	22	16	15	...
	1910	10	13	11	9	2	4	5	17	17	16	15	14	...
	1911	13	10	15	7	11	6	11	16	21	18	15	14	...
	1912	11	10	9	9	9	4	6	16	18	...	...	...	...
Average ...	...	11	11	12	8	8	7	9	16	18	19	15	14	148
White Leghorn	1909	...	...	...	...	13	13	11	17	22	23	21	14	...
	1910	13	12	11	5	2	11	15	15	19	16	24	20	...
	1911	15	13	9	5	5	2	6	12	13	17	15	13	...
	1912	9	8	8	7	9	4	9	14	12	...	..	...	...
Average ...	...	12	11	9	6	7	7	11	14	16	18	20	16	147
Silver-laced Wyandotte.	1909	...	...	...	...	2	3	12	14	16	18	15	20	...
	1910	13	11	11	9	6	10	10	10	17	19	17	15	...
	1911	16	14	15	6	9	11	15	19	15	18	16	18	...
	1912	13	11	13	9	13	7	8	15	17	...	...	18	...
Average ...	...	14	12	13	8	7	8	11	14	17	18	16	18	156

Experiments in Vinification.

L. A. MUSSO, Chemist's Branch.

SOME experiments were carried out in the chemical laboratory of the Department at vintage time last year, for the purpose of ascertaining the effect of the addition of tartaric acid to grape juice prior to fermentation.

The percentage of acids in the musts of this State is rather low in comparison with that in musts of European countries. This is due to the greater amount of heat and light that the grapes receive. Another influence tending to accentuate the difference of climate is the general practice amongst the vignerons of this State of delaying the vintage till the grapes have attained a degree of ripeness far more advanced than is usual at home. Though this causes an increase in the percentage of sugar in the juice, with a consequent increase in the alcoholic content of the resulting wine, as well as an augmentation of colour and body of the latter, it is followed by a still greater diminution in the free acids present It is known, in effect, that during the last period of maturity the proportion of free acids is continuously diminishing, though these acids are not destroyed, but neutralised by alkaline compounds drawn from the soil, especially potash.

The addition of tartaric acid to musts is preferable to citric acid, because the first precipitates a certain amount of potash, besides raising the acidity of the wine, and thereby increasing its good keeping qualities.

Owing to incomplete arrangements and the unfavourable weather, the tests could only be carried out on four kinds of grapes. The fermentation took place in small jars, of about two-thirds of a gallon capacity. The stalks were separated, only berries being left, and in the case of the white wines only the juice was allowed to ferment.

The first fermentation was complete in four to five days. There was hardly any increase of temperature noticeable in the fermenting liquid; only in one case did the thermometer show an increase of 1 degree centigrade (about 2 degrees Fahrenheit) above the outside temperature.

The wines were racked twice, filtered and bottled, and kept in the cellar up to the date of the first tasting.

Results of the Tests.

A first result was that in all cases the addition of tartaric acid had the effect of delaying the starting of the fermentation. This delay, which agrees with the observations of other experimenters, appears due to the fact that the yeast multiplies less rapidly in acid surroundings, without losing its fermenting power.* This is advantageous in our case, because one of the

* L. Semichon, Traité des Maladies des Vins. Paris, 1908, pp. 185-186.

inconveniences of wine-making in hot places like Australia, is the great rapidity with which fermentation begins and ends.

The delay was of about twenty-four hours ; its general effects, however, seem to be more durable, as they were noticeable at the time of the tasting, as will be explained further on.

The wines were analysed as soon as the first fermentation was over, and the results appear in the tables under the earlier date. They were subsequently racked and bottled. On the 18th October the bottles were opened, and a preliminary tasting took place. The tasters were Dr. Fiaschi, president of the New South Wales Wine Association, and Mr. V. R. Gosche, vice-president of the same association.

A second chemical analysis was made of the wines, the results of which are tabulated under the date 18th October, 1912.

Riesling.—The original acidity of the must was 5·5, and it was increased to 7 per thousand. No complaint of excessive acidity was raised at the tasting in regard to the wine from the acidified must. From the fact that the wine from the original must was found to be more advanced than the other, it may be presumed that the acid had somehow the effect of delaying the process of maturation in the wine, though otherwise there is no indication of it. Whether this is a good point or not may be debatable.

The analysis shows, among other things, that the added acid has disappeared almost completely during the first six months, as both wines, the one from the original must and that from the treated must, have the same amount of fixed acids. If the figures are compared with one another, it will be found that the acids of the untreated must decreased at the rate of 14 per cent., those of the acidified must at the rate of 33 per cent. So it is evident that the tartaric acid, after having exercised its influence in the fermentation, disappears with time. The danger of a wine too acid to the palate is out of the question in such cases as this.

How the wines will compare after further maturing will be seen in a few months.

Cabernet.—The acidity of this grape was already fairly high at the beginning ; still it could be raised up to 9·1 per thousand without any objectionable effect on its taste. When raised to 9·6 the tasters noticed it. A further trial may alter this impression. The addition of ½ per thousand of acid to the Cabernet must increased the yield of alcohol by ½ per cent. It has been already proved that the addition of acid to must is often accompanied by a greater production of alcohol.

In this case, also, the greater part of the added acid has disappeared in the six months passed ; more will disappear as the process of maturing goes on.

Syrah.—The rather high acidity of the must was still further raised from 8·5 to 9·5 per thousand without the experts noticing any excessive acid taste in the wine. During the six months since the first fermentation, the added acid has nearly completely disappeared, since the fixed acids are about the

same in the two wines. At the time of tasting, the wine from the original must was better than the other; the added acid would appear to have in this case also a retarding effect on the maturation of wine.

Pedro Ximenes.—The results obtained with this must are rather interesting. At the beginning, it will be noted that the acidity of the must was already 10 per thousand. Such an amount of acid is exceptional in this variety. Tests from Pedro Ximenes must from ripe grapes, carried out for many years, showed an average of 6·8 per thousand of acids.* Possibly, in this case the grapes were not absolutely ripe when crushed. A further 1 per thousand of acid was added, and, notwithstanding this great proportion of acids in the must, the resulting wine is considered superior to the wine from the natural must. With this grape the addition of tartaric acid has proved distinctly beneficial. The added acid, it is important to note, has disappeared, and the diminution of acidity which has taken place in the six months of maturing is proportionately higher than in the three other musts.

In both cases, viz., in the wine from the original must and in that from the acidified must, the acid content is only half after six months; exactly 49 per cent. of the former, and 51 per cent. of the second are missing.

Conclusion.

Though another tasting and successive analysis will be required, and in spite of the small scale on which the experiments were conducted, still some useful deductions can be drawn. These can be summarised as follow :—

1st.—The addition of tartaric acid to must delayed the starting of the first fermentation.

2nd.—The greater part, if not all, of the tartaric acid disappeared during the first six months of storage.

3rd.—In the making of dry wine with Riesling grapes, the acidity can be raised up to 7 per thousand without any effect on the taste of the wine. In the case of Carbernet grapes, the acidity of the must can be raised up to 9·1 per thousand; in the case of Syrah, up to 9·5 per thousand. With Pedro Ximenes, the acidity can be brought up to 11 per thousand.

It has to be pointed out that, for the purpose of good fermentation, the greater, within certain limits, the acidity of the must, the better will be the result of the fermentation. A certain amount of acid in the must will counterbalance the effects of the high temperature during the vat fermentation, and prevent the development of micro-organisms noxious to the wine.

The experiments carried out are not conclusive. In future years they will be made on a larger scale, with other varieties of grapes, and possibly from other points of view of interest to the local wine-maker.

The appended tables show details of the analyses.

* M. Blunno, *Agricultural Gazette* of New South Wales, 1906, p. 550 and following; 1908, p. 533; 1910, p. 975 and following.

EXPERIMENTS IN VINIFICATION.

NOTE.—Alcohol given in per cent. by volume. Total and fixed acids as tartaric, volatile acids as acetic, in parts per thousand.

Riesling.

Composition of the Must.			Composition of the Resulting Wine.				
				18th March, 1912.		18th October, 1912.	
	Original.	Treated.*		Wine from Original Must.	Wine from Treated Must.	Wine from Original Must.	Wine from Treated Must.
Sugar per cent. ...	19·65	19·65	Sugar	traces.	traces.	traces.	traces.
Total acids... ...	5·5	7·0	Total acids	5·7	6·4	5·3	5·6
			Fixed acids... ..	5·	5·7	4·7	4·7
			Volatile acids ...	0·56	0·56	0·5	0·7
			Alcohol (absolute)...	10·30	10·38	11·52	11·17

* The acidity of the original must was raised by 1·5 per thousand.

Result of the tasting, 18th October, 1912.—Wine from original must: Better sample, clearer, more advanced. Wine from treated must: Tastes of fermentation.

Cabernet.

Composition of the Must.				Composition of the Resulting Wines.					
				4th March, 1912.			18th October, 1912.		
	Original	Treated I.*	Treated II.†	Wine from Original Must.	Wine from Must Treated I.	Wine from Must Treated II.	Wine from Original Must.	Wine from Must Treated I.	Wine from Must Treated II.
Sugar per cent....	19·24	19·24	19·24	Sugar	...	...	...	traces.	traces.	traces.
Total acids ...	8·€	9·1	9·6	Total acids ...	6·3	7·3	8·5	5·8	6·7	7·7
				Fixed acids ...	5·7	6·5	7·9	5·1	6·0	6·7
				Volatile acids ..	0·5	0·6	0·5	0·6	0·6	0·8
				Alcohol (absolute)	9·87	11·52	10·56	11·00	11·61	11·35

* The acidity of the must was raised by 0·5 per thousand. † The acidity was raised by 1 per thousand.

Result of the tasting.—Wine from original must: Best sample, softer, more advanced sample from must treated II, too acid.

Syrah.

Composition of the Must.			Composition of the Resulting Wines.				
				5th March, 1912.		18th October, 1912.	
	Original.	Treated.*		Wine from Original Must.	Wine from Treated Must.	Wine from Original Must.	Wine from Treated Must.
Sugar per cent. ...	22·61	22·61	Sugar	traces.	traces.	traces.	traces.
Total acids ...	8·5	9·5	Total acids	6·5	7	6·1	6·4
			Fixed acids... ...	5·6	6·1	5·5	5·6
			Volatile acids ...	0·7	0·7	0·5	0·6
			Alcohol (absolute)...	11·87	11·87	11·96	12·31

* Acidity of the must raised by 1 per thousand.

Result of the Tasting.—Wine from original must: Better sample, more bouquet.

Pedro Ximenes.

Composition of the Must.			Composition of the Resulting Wine.				
				25th March, 1912.		18th October, 1912.	
	Original.	Treated.*		Wine from Original Must.	Wine from Treated Must.	Wine from Original Must.	Wine from Treated Must.
Sugar per cent. ...	18·90	18·90	Sugar	traces.	traces.	traces.	traces.
Total acids.. ...	10·0	11·0	Total acids	6·7	8·3	5·9	6·5
			Fixed acids... ..	6·2	7·8	5·1	5·4
			Volatile acids ...	0·4	0·4	0·6	0·88
			Alcohol	9·29	11·08	11·26	11·17

* Raised the acidity by 1 per thousand.

Result of the Tasting.—Wine from original must: Harsh taste. Wine from treated must: Better sample, softer.

Excessive Spraying with Red Oil Emulsion.

Some months ago an orchardist in the Bathurst district forwarded portion of an apple tree which had been killed by an affection of the bark just below ground level. A large number of trees had been similarly attacked, and the orchardist stated that "the trouble is an especially fatal one, and seriously threatens the important industry of apple-culture. I have wondered whether the spraying with red oil, which runs down the trunk of the tree, might cause the injury."

Mr. G. P. Darnell-Smith, Assistant Microbiologist, Bureau of Microbiology, visited the orchard and has supplied the following report:—

A number of apple trees in this orchard, which is most carefully tended and cultivated, have died. The owner estimates his loss at £250. The death of the trees has probably been caused by too severe an application of red oil. This has been very freely employed in order to keep woolly aphis in check. That the death of the trees has been caused by spraying is rendered evident by the fact that trees opposite one another in adjacent rows have died, and that those which survive show a gradual diminution in vitality, those most seriously affected being adjacent to those that have died. On unearthing the bowl of the tree it is found that the bark in the most seriously affected trees has been entirely destroyed, the exposed wood being brown and semi-translucent, whilst the roots below this portion of destroyed bark (which extends round the tree as a ring 2 or 3 inches deep) and the stem above are perfectly healthy. In trees only slightly affected the ringing of the bark is not complete, and the trees are making an attempt to form a callus over the wound. It is noticeable that in these trees an extraordinary amount of blossom has been produced. It appears that when the trees have been sprayed for woolly aphis with red oil emulsion this has run down the stem of the tree, soaked into the ground, and the water evaporating, the concentrated oil has destroyed the bark at the foot of the tree. It is possible that the spray in the barrel has not been kept thoroughly emulsified during the process of spraying. If anything has occurred to throw the oil out of its state of emulsification then it is possible that the first trees sprayed would get a very weak solution, while the last trees sprayed from the barrel would get an extremely strong one,

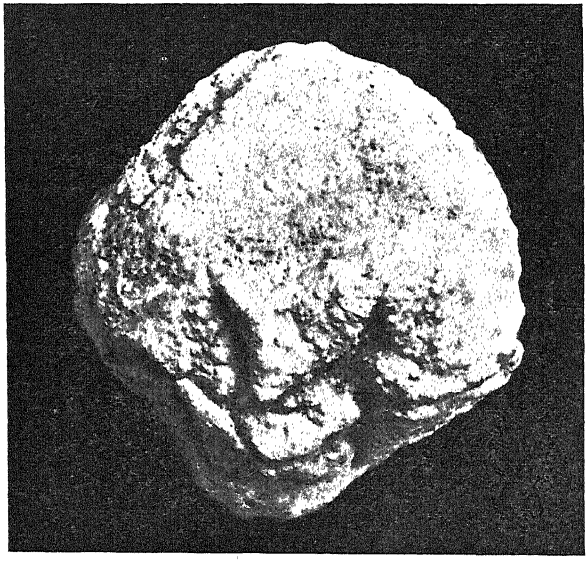
Destruction of Prickly Pear.

On a small scale, I have recently tried numerous methods for killing Prickly Pear. Among those tried the following may be mentioned :—

1. Treating the pear with injections of sodium arsenite, lysol, formalin, carbolic acid, sulphuric acid, ammonia, solution of copper carbonate in ammonia, solution of cuprous chloride in ammonia, 20 per cent. solution of copper sulphate, 12 per cent. solution of copper sulphate.
2. Infection with *B. coli communis, proteus vulgaris, Bacilli lactici,* &c., and various fungi.
3. Spraying the pear with a black liquid so as to cut off all light.

The most marked success was obtained with the 12 per cent. solution of copper sulphate. This suggested stabbing the plant and inserting a *crystal* of copper sulphate. On the comparatively small plants used the effect was rapid and complete, the whole plant dying in about four days. Judging from the results obtained the method would probably answer if tried on a large scale.—G. P. Darnell-Smith, B.Sc., Assistant Microbiologist, Bureau of Microbiology.

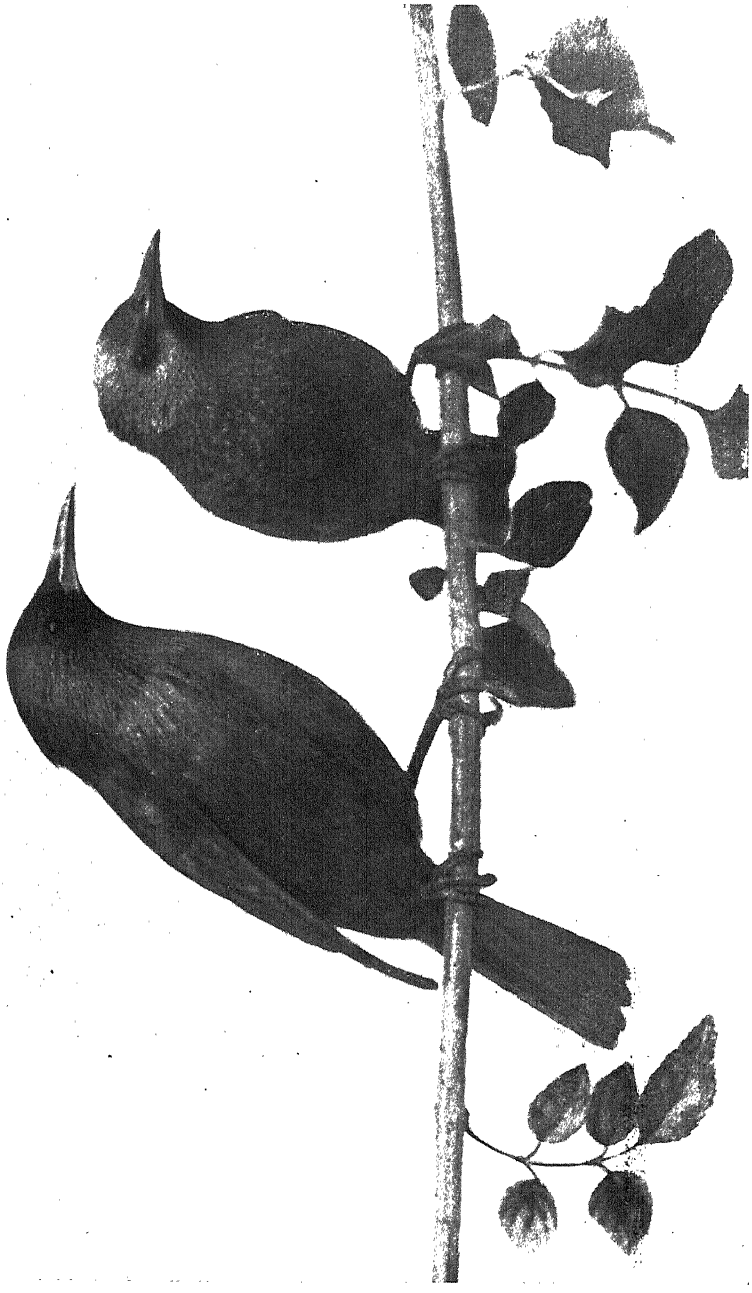
Soft-shelled Eggs.



A soft-shelled egg laid by a fat Orpington hen at Mr. W. E. Boucher's poultry yard, Canterbury.

Mr. W. E. Boucher, of Canterbury, brought to this office the egg of which a photograph is published, to illustrate his disagreement with a popular opinion. The popular opinion is that a fat hen will not lay soft eggs.

Mr. Boucher has a Black Orpington hen, 18 months old, which he specially fattened to ascertain the effect upon the eggs. She was fed on mutton fat, suet, and other fatty foods until she weighed 10½ lb. She has been continuously laying soft eggs, and the large, soft, irregular-shaped egg illustrated was laid on 17th December.



The Starling. (*Sturnus vulgaris.*) [Reduced.]
[See *Agricultural Gazette*, July, 1912, page 610.]

The Government-bred Jersey Bull "Sir Jack."

[See *Agricultural Gazette*, January, 1913, page 85.]

Fumigation.

W. J. ALLEN.

OWING to the great diversity of opinion which has existed as to the efficiency of the several solutions recommended and used for spraying trees, and the necessity, even after a satisfactory spray had been found, of repeating the operation so often in a short period of time, a large number of our citrus growers have abandoned this method of fighting scales of different sorts and have substituted fumigation, with, I am pleased to say, in nine cases out of ten, highly satisfactory results. There have been some, as there always are in every experiment of the kind, who have not been so successful, and therefore condemn unhesitatingly, while the chances are the fault has been with themselves, either in fumigating at the wrong time or in not exercising due precautions in the carrying out of the work.

Reasons of Failure.

Among some of the causes of failure which have come under my notice and which, wherever it has been possible, I have made an effort to find out, are:—First—under-estimating the size of the tree; second—fumigating at the wrong time; third—neglect to see that the tents were free from holes; fourth—carelessness in weighing the cyanide; fifth—an insufficient quantity of water or sulphuric acid to dissolve the cyanide; and sixth—boiling over of the generator.

This treatment, like any other, requires to be carried out carefully and systematically, and there must be no trusting to guesswork, or it cannot be expected that the operator will be as successful as his more careful neighbour who, by the exercise of a little patience and discretion, without any apparent trouble, rids his trees and fruit, not only of scales, but of the black and disfiguring smut.

Since the publication of the results of the experiments which I carried out in the Glenorie district some twelve years ago, and which gave such excellent results, many growers have adopted this method, and it is no uncommon sight, in driving through our fruit-growing districts at the proper time, to see trees covered by tents in many of the orchards, and of the number of growers following this method many are doing the work regularly every year; so much so, indeed, that the process is now long past the experiment stage, as a number of our largest and most up-to-date growers have been fumigating for a good number of years. It is very gratifying to me to find that many of those whom it was most difficult to induce to try this method are now the most enthusiastic in its praise as being the best means of helping them to

keep their orchards clean. In addition to the number of opinions attached to my previous report, dozens of others have written me acknowledging the beneficial results following on this treatment, particular stress being laid on the fact of the luxuriance of the growth after cyaniding, the glossy, rich appearance of the leaves, and the improvement in the quality of the fruit, which is larger, smoother, and thinner-skinned, and in every respect a better commercial article than could ever be produced from scale-infested trees.

Thanks to fumigation, there are to-day in this State thousands of cases of both oranges and lemons which can find an entry into any State in the Commonwealth, and with which no inspector can find room for complaint.

Measuring the Tree.

With reference to those cases where fumigation has not proved entirely satisfactory, owing, as I said before, to *under-estimating the size of the tree*, I might say that in measuring the tree it is necessary to get the extreme height and width, as if this is not done, and in consequence a smaller charge applied than the tree should really have, the scales may not all be killed, as in my original table I have given the very least quantities which will suffice to clean the tree.

It is easy to ascertain the size of the tree by using a pole with, at intervals of every foot, a distinct mark painted or cut in it, so that all the operator has to do is to hold it up to the tree and find out the extreme height and width ; then by referring to the table the quantity of chemicals required can be found opposite the figures corresponding with the size of the tree.

The Morrill method of calculating the volume of a tent covering a tree is also described below.

Time for Fumigating.

While fumigating can be carried out almost any time of the year, best results are obtained by fumigating in February and March, and the work is best carried out at night. At that period of the year most of the scales are young and tender soon after hatching and are least protected, and in order to rid the tree of all insects of this kind with one treatment, the work is best performed in the months mentioned. As regards the Indian Wax Scale, January and February is the only period of the year when they can be successfully treated, as later, when well protected by the waxy covering, they cannot readily be destroyed. Also, in the case of the Brown Scale, or what is (erroneously) commonly known throughout the Cumberland district as the Black Bug, when the scales are old and only eggs found under the shell it is much more difficult to clear the tree than when the young insect is just hatched.

In conducting experiments in fumigating while the fruit was of small size, Mr. R. S. Woglum found that heavy dosages cannot be used while the fruit is small without more or less injury. Thus, it may be stated, that the most critical period for conducting fumigation is between the time the fruit sets

and the time it attains a diameter of about an inch. This period occurs during the late spring or early summer. It is advised not to fumigate during this period.

Mr. Woglum also advises that fumigation should be discontinued when the temperature rises above 65° Fahr. and in the case of cold weather it should not be continued when the temperature falls below 38° Fahr.

By treating the trees at this time of the year nearly all the scales are destroyed, and the few that may be left will have little time to breed before the cold weather sets in, and, in consequence, the few that may hatch cannot spread over many of the oranges.

Another reason in its favour is that the fruit is still growing and expanding, and, while in this stage, the dead scale will come off before the fruit ripens. If, on the other hand, the trees are treated when the fruit is ripe, the scale, while it may be killed, will adhere to the fruit and will be found very difficult to remove, even with a brush.

If the trees are treated early in the spring the chances are that, should a few scale be missed, by the autumn these few have multiplied and spread over a considerable portion of the tree and fruit, and will spoil the latter for export purposes.

The work, as I said before, is best done at night, as there is less danger of harming the tree, even if the charge is a little heavier than it should be. If this were done in the daytime, or even the ordinary charge used if the day were hot, many of the leaves might be removed and some of the small twigs burnt. Therefore, as far as possible, do the work at night, late in the evening, early in the morning, or on cool, cloudy days, but never, by any chance, during the heat of the day.

Lemon and mandarin trees, it is found, stand the fumigation much better than the orange—that is, taking two trees of equal size and treating them with the same charge, while the mandarin would not show any ill-effect, the orange-tree would lose a few of its leaves. I would, therefore, recommend always treating the latter at night, or on cool and dull days. The night treatment appears to be the best, however, as a charge which would in the daytime remove leaves, and perhaps burn a little of the tender part of the twigs, would have no detrimental effect where the work was performed at night. I think that lemon and mandarin trees can be treated with very good results during the daytime, except on very hot days, when I would not recommend continuing the work.

I would always caution fumigators to use great care when treating weak trees, as they are always more susceptible to injury.

Holes in the Tents.

Always see that the tents are patched and free from holes before starting to fumigate, otherwise the holes provide an escape for the fumes, and the work is not done properly.

Weighing the Cyanide and Sulphuric Acid.

Great care must be taken to have the chemicals accurately measured out. I have seen some operators at work who exercised care in weighing out the cyanide and measuring the sulphuric acid (which latter is, of course, liquid measure), and yet the cyanide was not dissolved. The trouble in this case was that the sulphuric acid was not up to strength. In such cases a greater quantity of the acid must be added until sufficient is given, so that upon emptying the generator it is found that the cyanide is thoroughly dissolved.

On the other hand, I have heard of certain growers who have dispensed altogether with the use of the scale and measuring glass, and simply guess at the quantities required. Is it any wonder, therefore, that we read of a tree being damaged or killed occasionally; or that with those who will not exercise the precautions impressed upon them, fumigation has turned out unsuccessful?

If sufficient cyanide, sulphuric acid, and water are put in the generator and placed under an air-tight tent at the proper time, the scale insects on the trees so covered are bound to be killed; they cannot escape, unless perhaps an odd one which may be protected by a fold of the tent, or between a few leaves which may be pressed together by the weight of the tent.

Methods of Procedure.

The water is first poured in the basin or generator, then the sulphuric acid added, and the generator placed well under the tree and away from the tent, so that when the cyanide is dropped gently into the vessel there may be no danger of the contents splashing on to the tent. When fumigating, it is often found that however careful one may be, the tents seem to become more or less damaged with small pin holes. This condition is brought about when care is not taken to cover the generator with a spreader for distributing the gas evenly and preventing any splashing of the liquids taking place. Then, again, this method prevents any acid being carried along with the gas and thereby causing the holes in the tents.

It must be clearly understood that it is essential to add the cyanide immediately after the sulphuric acid, as if this is not done there is not such a good reaction, and this is especially noticeable when the acid and water have cooled.

When the tent or sheet is over the tree, and the sides, with the exception of one place, are held down by earth, put the vessel containing the water and sulphuric acid well under the tree, and then by inserting the arm through the loose part of the tent and holding the material close, drop in the cyanide and withdraw the arm, throwing some earth on the loose canvas to hold it down.

Time.

The trees should be allowed to remain covered for forty-five minutes, as it has been found that in that time all scales are killed, and the work is beyond doubt properly done.

Fumigation Tables.

For ordinary purposes the original table (No. 1) as published in my first pamphlet on fumigating experiments, will be found of sufficient strength where the trees are infested with Red Scale only, but where the trees are badly infested with Red and Brown Scale, White Louse, &c., I would recommend following the revised table (No. 2), which shows an increase in the strength of the charge of one-eighth, and which should clean the worst trees; but the latter strength should never be used except at night time, and under no circumstances on a hot day.

When large quantities are used, it is best to divide the charge, using two generators in place of one, and to place either a board or tin over the generator and a few inches above it, so as to spread the fumes which might otherwise prove too strong for the leaves and twigs immediately above them, some of which might be burnt. As a matter of fact, it will be found advantageous to place a covering over the generator at all times, as it helps to spread the fumes, and prevents damage to tents or sheets.

The tables are arranged so that the *diameters* of the trees are in numerical order.

For fumigating deciduous trees for San José and other scales in the winter while the trees are dormant, the charge may be increased by one-third.

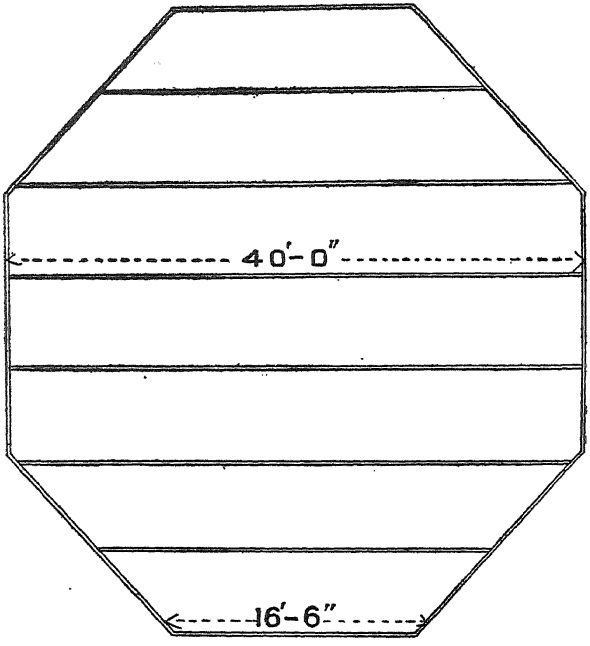
Fumigating Tents and Sheets.

These can be either in the form of sheets, circular tents, or box-tents, according to the size of the trees to be covered. One of the objections raised in the early part of the history of fumigation was the cost of materials for making the tents; and although at one time this threatened to be a serious drawback, yet now it has been shown that a cheaper material will answer the purpose quite as well, but it must be closely woven, and not an open mesh, for on this depends to some extent the cost of the operation. A charge recommended with tents of a given degree of tightness will not produce the same results with tents of less closely woven material. The outlay is more than covered by the increase in the prices obtained for the clean fruit.

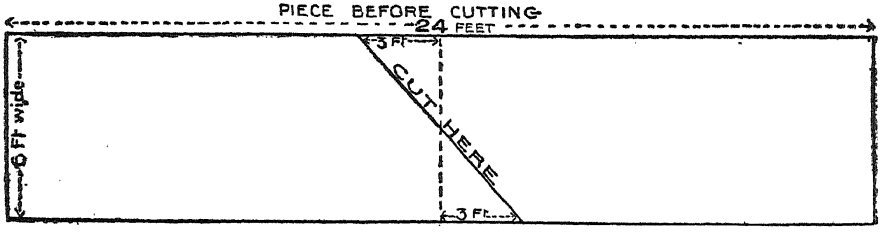
The leading chemist and druggist stores in Sydney stock cyanide of potassium and sulphuric acid. The prices at present quoted by Messrs. Elliott Brothers, O'Connell-street, are as follow:—Cyanide of potassium, 2-cwt. lots, 9d. per lb.; 1-cwt. lots, 9½d. per lb.; 56-lb. lots, 10d. per lb.; 28-lb. lots, 11d. per lb.; sulphuric acid, in 40-lb. jars, costs 1½d. per lb. Measuring glass and generating vessels are kept in stock; prices on application.

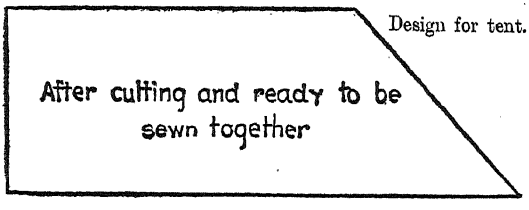
For small trees, from 3 to 6 feet high, the box-tent made of calico or even strong paper, tacked over a frame, will do, being light, cheap, and easily handled. When fumigating small trees, one must take into consideration the leakage of gas through the tent, as it is generally known that the leakage is much more rapid in the smaller tents than in the larger ones.

Circular tents, made as per instructions given below, are found most economical for trees from 6 to 12 feet high, but for trees of larger size sheets are the more quickly and easily handled, although more costly than tents.



Octagonal sheet for fumigating large trees. Size as indicated. Seams 2 inches wide around outer edges and at junction of strips of material. To make a sheet of this size will require 78 yards of sheeting 6 feet wide.





Design for tent.

CAUTION.—On no account should trees be fumigated for at least six months after they have been sprayed with Bordeaux Mixture. If it is necessary to spray with this mixture, an application may be made within a few days after fumigating.

No. 1 Table.

Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.	Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.
ft.	ft.	cub. ft.	oz. av.	fl. oz.	fl. oz.	ft.	ft.	cub. ft.	oz. av.	fl. oz.	fl. oz.
4	3	25	¾	¾	2	11	11	941	4¾	5	14
4	4	45	¾	¾	2	12	11	1,026	5¼	6	16
5	4	57	¾	¾	2	13	11	1,112	5¾	6	17
6	4	68	¾	1	2	14	11	1,197	6	6	18
7	4	79	¾	1	2	15	11	1,283	6⅓	7	19
4	5	71	¾	1	2	16	11	1,368	7	7	21
5	5	88	¾	1	2	6	12	611	3¼	4	10
6	5	106	¾	1	2	7	12	713	3⅝	4	11
7	5	124	1	1	3	8	12	814	4¼	5	13
8	5	141	1	1	3	9	12	916	4¾	5	14
4	6	102	1	1	2	10	12	1,018	5¼	6	16
5	6	127	1	1	3	11	12	1,120	5⅞	6	17
6	6	153	1	1	3	12	12	1,221	6¼	7	19
7	6	178	1	1	3	13	12	1,323	6¾	7	20
8	6	204	1	1	3	14	12	1,425	7¼	8	22
9	6	229	1¼	2	4	15	12	1,527	7¾	8	23
4	7	139	1	1	3	16	12	1,629	8¼	9	25
5	7	173	1	1	3	17	12	1,730	8¾	9	26
6	7	208	1¼	2	4	18	12	1,832	9¼	10	28
7	7	242	1¼	2	4	19	12	1,934	9¾	10	29
8	7	277	1½	2	4	20	12	2,036	10¼	11	31
9	7	312	1⅝	2	5	7	13	836	4¼	5	13
10	7	346	1⅝	2	5	8	13	956	4¾	5	14
6	8	271	1½	2	4	9	13	1,075	5½	6	16
7	8	317	1⅝	2	5	10	13	1,195	6	6	18
8	8	362	1⅝	2	5	11	13	1,314	6⅝	7	20
9	8	407	2	2	6	12	13	1,433	7¼	8	22
10	8	452	2⅓	3	7	13	13	1,553	7⅞	8	23
11	8	498	2½	3	7	14	13	1,672	8½	9	25
12	8	543	2¾	3	8	15	13	1,792	9	9	27
6	9	344	1¾	2	5	16	13	1,911	9⅝	10	29
7	9	401	2	2	6	17	13	2,031	10¼	11	31
8	9	458	2¼	3	5	18	13	2,150	10⅝	11	32
9	9	515	2⅝	3	8	19	13	2,270	11½	12	34
10	9	573	3	3	9	20	13	2,389	12	12	36
11	9	630	3¼	4	10	8	14	1,108	5⅝	6	17
12	9	687	3½	4	10	9	14	1,247	6¼	7	19
6	10	424	2¼	3	7	10	14	1,385	7	7	21
7	10	495	2½	3	7	11	14	1,524	7¾	8	23
8	10	565	3	3	9	12	14	1,663	8⅓	9	25
9	10	636	3¼	4	10	13	14	1,801	9	9	27
10	10	707	3½	4	10	14	14	1,940	9¾	10	29
11	10	778	4	4	12	15	14	2,078	10½	11	31
12	10	848	4¼	5	13	16	14	2,217	11¼	12	34
13	10	919	4⅝	5	14	17	14	2,355	11⅞	12	35
14	10	990	5	5	15	18	14	2,494	12½	13	36
6	11	513	2⅝	3	8	19	14	2,632	13¼	14	40
7	11	599	3	3	9	20	14	2,771	14	14	42
8	11	684	3½	4	10	8	15	1,272	6½	7	19
9	11	770	4	4	12	9	15	1,431	7¼	8	22
10	11	855	4⅓	5	13	10	15	1,590	8	8	24

No. 1 Table—*continued.*

Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.	Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.
ft.	ft.	cub. ft.	oz. av.	fl. oz.	fl. oz.	ft.	ft.	cub. ft.	oz. av.	fl. oz.	fl. oz.
11	15	1,749	8¾	9	26	14	18	3,206	16	16	48
12	15	1,909	9⅜	10	29	15	18	3,435	17¼	18	52
13	15	2,068	10⅓	11	31	16	18	3,664	18⅜	19	55
14	15	2,227	11¼	12	34	17	18	3,893	19½	20	58
15	15	2,386	12	12	36	18	18	4,122	20¾	21	62
16	15	2,545	12¾	13	38	19	18	4,351	21¾	22	65
17	15	2,704	13⅜	14	41	20	18	4,580	23	23	69
18	15	2,863	14⅓	15	43	21	18	4,809	24	24	72
19	15	3,022	15¼	16	46	22	18	5,038	25¼	26	76
20	15	3,181	16	16	48	23	18	5,268	26⅓	27	79
21	15	3,340	16¾	17	50	24	18	5,497	27½	28	82
22	15	3,499	17½	18	52	25	18	5,726	28⅝	29	86
23	15	3,658	18⅓	19	55	26	18	5,955	29¾	30	89
24	15	3,817	19¼	20	58	11	19	2,807	14	14	42
8	16	1,448	7¼	8	22	12	19	3,062	15⅓	16	46
9	16	1,629	8¼	9	25	13	19	3,317	16⅝	17	50
10	16	1,810	9¼	10	28	14	19	3,572	18	18	54
11	16	1,991	10	10	30	15	19	3,828	19¼	20	58
12	16	2,171	11	11	33	16	19	4,083	20½	21	61
13	16	2,352	11¾	12	35	17	19	4,338	21¾	22	65
14	16	2,533	12¾	13	38	18	19	4,593	23	23	69
15	16	2,714	13⅜	14	41	19	19	4,848	24⅓	25	73
16	16	2,895	14½	15	43	20	19	5,104	25⅝	26	76
17	16	3,076	15½	16	46	21	19	5,359	26¾	27	80
18	16	3,257	16⅜	17	49	22	19	5,614	28¼	29	85
19	16	3,438	17¼	18	52	23	19	5,869	29⅓	30	88
20	16	3,619	18¾	19	55	24	19	6,124	30¾	31	92
21	16	3,800	19	19	57	25	19	6,379	32	32	96
22	16	3,981	20	20	60	26	19	6,635	33¼	34	100
23	16	4,162	20¾	21	62	27	19	6,890	34⅓	35	103
24	16	4,343	21¾	22	65	28	19	7,145	35½	36	106
25	16	4,524	22¾	23	68	12	20	3,393	17	17	51
26	16	4,705	23⅝	24	71	13	20	3,676	18½	19	55
9	17	1,839	9¼	10	28	14	20	3,958	19¾	20	59
10	17	2,043	10¼	11	31	15	20	4,241	21¼	22	64
11	17	2,247	11¼	12	34	16	20	4,524	22¾	23	68
12	17	2,451	12½	13	37	17	20	4,807	24	24	72
13	17	2,656	13⅓	14	40	18	20	5,089	25½	26	76
14	17	2,860	14⅓	15	43	19	20	5,372	27	27	81
15	17	3,064	15⅓	16	46	20	20	5,655	28¼	29	85
16	17	3,269	16⅜	17	49	21	20	5,938	29¾	30	89
17	17	3,473	17½	18	52	22	20	6,220	31¼	32	94
18	17	3,677	18½	19	55	23	20	6,503	32⅝	33	98
19	17	3,881	19½	20	58	24	20	6,786	34	34	102
20	17	4,086	20⅔	21	61	25	20	7,069	35⅓	36	106
21	17	4,290	21½	22	64	26	20	7,351	36¾	37	110
22	17	4,494	22⅝	23	67	12	21	3,741	18¾	19	56
23	17	4,699	23½	24	70	13	21	4,052	20¼	21	61
24	17	4,903	24⅝	25	74	14	21	4,364	22	22	66
25	17	5,107	25⅝	26	77	15	21	4,676	23½	24	70
26	17	5,311	26⅝	27	80	16	21	4,988	25	25	75
10	18	2,290	11½	12	34	17	21	5,299	26½	27	79
11	18	2,519	12¾	13	38	18	21	5,611	28¼	29	85
12	18	2,748	13¾	14	41	19	21	5,923	29¾	30	89
13	18	2,977	15	15	45	20	21	6,235	31¼	32	94

No. 1 Table—*continued.*

Height.	Diameter	Capacity	Cyanide	Sulphuric Acid	Water	Height	Diameter	Capacity	Cyanide.	Sulphuric Acid	Water
ft.	ft.	cub. ft	oz. av.	fl oz	fl. oz	ft.	ft.	cub ft.	oz. av	fl oz	fl oz.
21	21	6,546	32¾	33	98	17	23	6,357	32	32	96
22	21	6,858	34⅓	35	103	18	23	6,731	33¾	34	101
23	21	7,170	36	36	108	19	23	7,105	35⅔	36	107
24	21	7,481	37½	38	112	20	23	7,479	37½	38	112
25	21	7,793	39	39	117	21	23	7,853	39⅓	40	118
26	21	8,105	40½	41	121	22	23	8,227	41¼	42	124
12	22	4,105	20½	21	61	23	23	8,600	43	43	129
13	22	4,448	22½	23	67	24	23	8,974	45	45	135
14	22	4,790	24	24	72	25	23	9,348	46¾	47	140
15	22	5,132	25¾	26	77	26	23	9,722	48⅔	49	146
16	22	5,474	27½	28	82	27	23	10,096	50½	51	151
17	22	5,816	29¼	30	88	12	24	4,886	24½	25	73
18	22	6,158	30¾	31	92	13	24	5,293	26½	27	79
19	22	6,500	32½	33	97	14	24	5,700	28½	29	85
20	22	6,842	34½	35	103	15	24	6,107	30⅔	31	92
21	22	7,185	36	36	108	16	24	6,514	32½	33	98
22	22	7,527	37¾	38	113	17	24	6,922	34¾	35	104
23	22	7,869	39⅓	40	118	18	24	7,329	36¾	37	110
24	22	8,211	41¼	42	124	19	24	7,736	38¾	39	116
25	22	8,553	42¾	43	128	20	24	8,143	40¾	41	122
26	22	8,895	44½	45	133	21	24	8,550	42¾	43	128
12	23	4,487	22½	23	67	22	24	8,957	44¾	45	134
13	23	4,861	24⅓	25	73	23	24	9,364	46¾	47	140
14	23	5,235	26¼	27	79	24	24	9,772	49	49	147
15	23	5,609	28	28	84	25	24	10,179	51	51	153
16	23	5,983	30	30	90	26	24	10,586	53	53	159

No. 2, or Revised Table.

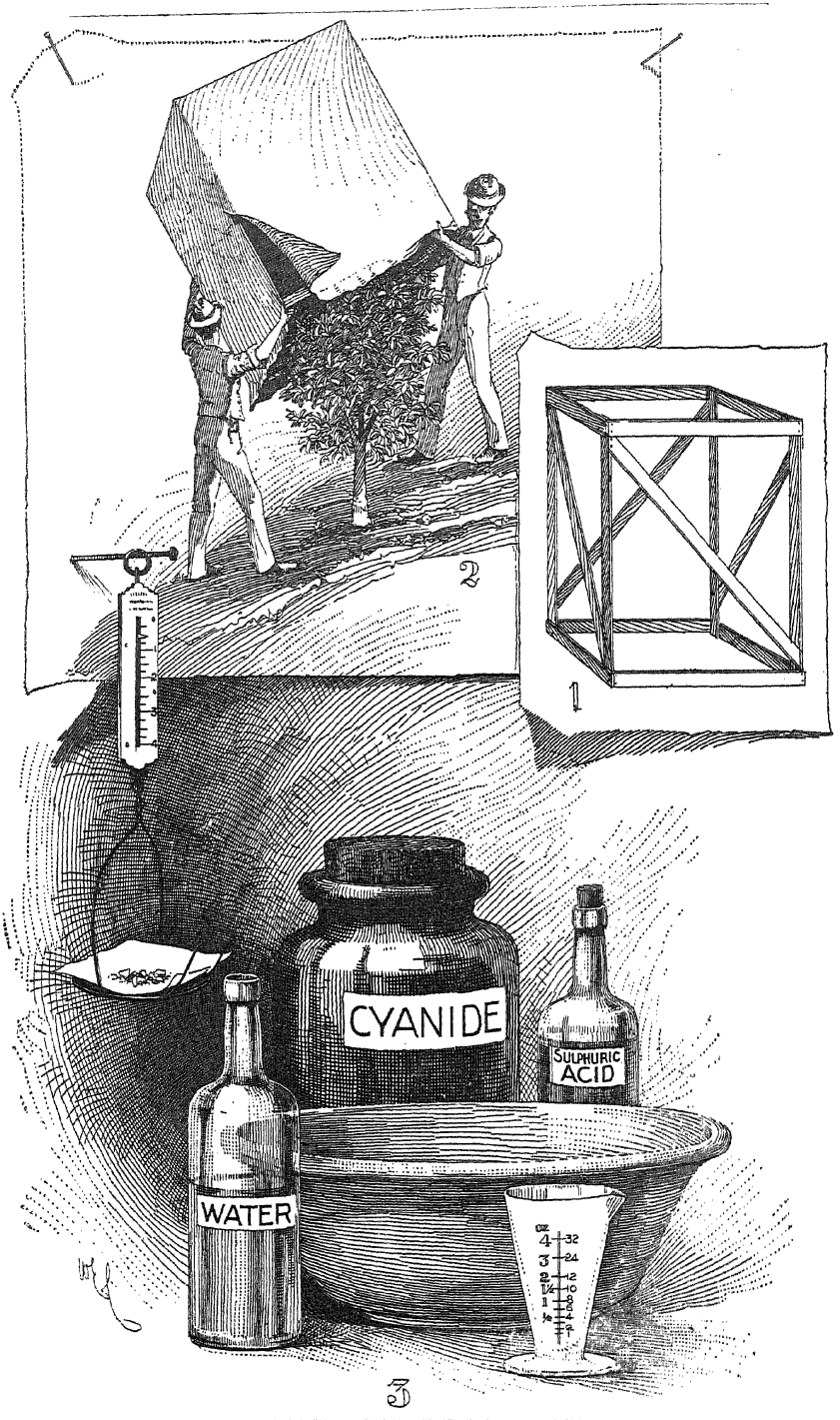
4	3	25	¾	1	2	8	8	362	2	2	6
4	4	45	¾	1	2	9	8	407	2⅓	2½	7
5	4	57	¾	1	2	10	8	452	2⅔	3	8
6	4	68	¾	1	2	11	8	498	3	3	9
7	4	79	¾	1	2	12	8	543	3¼	3½	10
4	5	71	¾	1	2	6	9	344	2	2	6
5	5	88	¾	1	3	7	9	401	2⅓	2½	7
6	5	106	1	1	3	8	9	458	2⅔	3	8
7	5	124	1	1	3	9	9	515	3	3	9
8	5	141	1	1	3	10	9	573	3⅓	3½	10
4	6	102	1	1	2	11	9	630	3⅔	4	11
5	6	127	1	1	3	12	9	687	4	4	12
6	6	153	1	1	3	6	10	424	2½	3	7
7	6	178	1	1	3	7	10	495	2¾	3	8
8	6	204	1¼	1⅓	4	8	10	565	3¼	3½	10
9	6	229	1⅓	1⅓	4	9	10	636	3⅔	4	11
4	7	139	1	1	3	10	10	707	4	4	12
5	7	173	1	1	3	11	10	778	4½	4½	13
6	7	208	1¼	1½	4	12	10	848	5	5	15
7	7	242	1½	1½	5	13	10	919	5¼	5½	16
8	7	277	1⅔	2	5	14	10	990	5⅔	6	17
9	7	312	1¾	2	5	6	10	513	3	3	9
10	7	346	2	2	6	7	11	599	3½	4	10
6	8	271	1¾	2	5	8	11	684	4	4	12
7	8	317	1¾	2	5	9	11	770	4½	5	13

No. 2, or Revised Table—*continued.*

Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.	Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.
ft.	ft.	cub. ft.	oz. av.	fl. oz.	fl. oz.	ft.	ft.	cub. ft.	oz. av.	fl. oz.	fl. oz.
10	11	855	5	5	15	14	15	2,227	12¾	13	38
11	11	941	5½	6	16	15	15	2,386	13¾	14	40
12	11	1,026	6	6	18	16	15	2,545	14½	15	43
13	11	1,112	6½	7	19	17	15	2,704	15½	16	46
14	11	1,197	7	7	21	18	15	2,863	16⅓	17	49
15	11	1,283	7¼	8	22	19	15	3,022	17¼	18	52
16	11	1,368	7¾	8	23	20	15	3,181	18¼	19	55
6	12	611	3½	4	10	21	15	3,340	19	19	57
7	12	713	4	4	12	22	15	3,499	20	20	60
8	12	814	4⅝	5	14	23	15	3,658	21	21	63
9	12	916	5¼	6	16	24	15	3,817	22	22	66
10	12	1,018	5¾	6	17	8	16	1,448	8¼	9	25
11	12	1,120	6½	7	19	9	16	1,629	9⅓	10	28
12	12	1,221	7	7	21	10	16	1,810	10⅓	11	34
13	12	1,323	7½	8	22	11	16	1,991	11⅓	12	34
14	12	1,425	8	8	24	12	16	2,171	12½	13	37
15	12	1,527	8¾	9	26	13	16	2,352	13½	14	40
16	12	1,629	9⅓	10	28	14	16	2,533	14½	15	43
17	12	1,730	10	10	30	15	16	2,714	15⅓	16	46
18	12	1,832	10½	11	31	16	16	2,895	16⅝	17	50
19	12	1,934	11	11	33	17	16	3,076	17⅝	18	53
20	12	2,036	11⅝	12	35	18	16	3,257	18⅝	19	56
7	13	836	4¾	5	14	19	16	3,438	19¾	20	59
8	13	956	5½	6	16	20	16	3,619	20⅝	21	62
9	13	1,075	6	6	18	21	16	3,800	21¾	22	65
10	13	1,195	7	7	21	22	16	3,981	22¾	23	68
11	13	1,314	7½	8	22	23	16	4,162	24⅓	25	73
12	13	1,433	8¼	9	25	24	16	4,343	25⅓	26	76
13	13	1,553	9	9	27	25	16	4,524	26⅓	27	79
14	13	1,672	9⅝	10	27	26	16	4,705	27½	28	82
15	13	1,792	10¼	11	31	9	17	1,839	10½	11	31
16	13	1,911	11	11	33	10	17	2,043	11⅝	12	35
17	13	2,031	11⅝	12	35	11	17	2,247	12¾	13	38
18	13	2,150	12¼	13	37	12	17	2,451	14	14	42
19	13	2,270	13	13	39	13	17	2,656	15¼	16	46
20	13	2,389	13⅝	14	41	14	17	2,860	16⅓	17	49
8	14	1,108	6⅓	7	19	15	17	3,064	17½	18	52
9	14	1,247	7¼	8	22	16	17	3,269	18⅝	19	56
10	14	1,385	8	8	24	17	17	3,473	19¾	20	59
11	14	1,524	8¾	9	26	18	17	3,677	21	21	63
12	14	1,663	9½	10	28	19	17	3,881	22¼	23	67
13	14	1,801	10¼	11	31	20	17	4,086	23⅓	24	70
14	14	1,940	11¼	12	34	21	17	4,290	25	25	75
15	14	2,078	12	12	36	22	17	4,494	26¼	27	79
16	14	2,217	12⅝	13	38	23	17	4,699	27½	28	82
17	14	2,355	13½	14	40	24	17	4,903	28⅝	29	86
18	14	2,494	14¼	15	43	25	17	5,107	29¾	30	89
19	14	2,632	15	15	45	26	17	5,311	31	31	93
20	14	2,771	16	16	48	10	18	2,290	13	13	39
8	15	1,272	7¼	8	22	11	18	2,519	14⅓	15	43
9	15	1,431	8¼	9	25	12	18	2,748	15¾	16	47
10	15	1,590	9	9	27	13	18	2,977	17	17	51
11	15	1,749	10	10	30	14	18	3,206	18⅓	19	55
12	15	1,909	11	11	33	15	18	3,435	19⅝	20	59
13	15	2,068	11¾	12	35	16	18	3,664	21	21	63

No. 2, or Revised Table—*continued.*

Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.	Height.	Diameter.	Capacity.	Cyanide.	Sulphuric Acid.	Water.
ft.	ft.	cub. ft.	oz. av.	fl. oz.	fl. oz.	ft.	ft.	cub. ft.	oz. av.	fl. oz.	fl. oz.
17	18	3,893	22¼	23	67	21	21	6,546	38	38	114
18	18	4,122	24	24	72	22	21	6,858	39⅜	40	119
19	18	4,351	25½	26	76	23	21	7,170	41½	42	124
20	18	4,580	26⅝	27	80	24	21	7,481	43⅓	44	130
21	18	4,809	28	28	84	25	21	7,793	45	45	135
22	18	5,038	29⅛	30	88	26	21	8,105	47	47	141
23	18	5,268	30⅝	31	92	12	22	4,105	24	24	72
24	18	5,497	32	32	96	13	22	4,448	26	26	78
25	18	5,726	33⅓	34	100	14	22	4,790	28	28	84
26	18	5,955	34⅝	35	104	15	22	5,132	30	30	90
11	19	2,807	16	16	48	16	22	5,474	32	32	96
12	19	3,062	17½	18	52	17	22	5,816	33¾	34	101
13	19	3,317	19	19	57	18	22	6,158	35¼	36	107
14	19	3,572	20⅘	21	61	19	22	6,500	37¾	38	113
15	19	3,828	22	22	66	20	22	6,842	39⅞	40	119
16	19	4,083	23⅓	24	70	21	22	7,185	41⅞	42	125
17	19	4,338	25⅓	26	76	22	22	7,527	43⅞	44	131
18	19	4,593	26⅞	27	80	23	22	7,869	45½	46	136
19	19	4,848	28¼	29	85	24	22	8,211	47½	48	142
20	19	5,104	29¾	30	89	25	22	8,553	49½	50	148
21	19	5,359	31¼	32	94	26	22	8,895	51⅓	52	154
22	19	5,614	32⅞	33	98	12	23	4,487	26¼	27	79
23	19	5,869	34	34	102	13	23	4,861	28⅜	29	85
24	19	6,124	35⅝	36	107	14	23	5,235	30½	31	91
25	19	6,379	37	37	111	15	23	5,609	32⅝	33	98
26	19	6,635	38½	39	115	16	23	5,983	34¾	35	104
27	19	6,890	40	40	120	17	23	6,357	37	37	111
28	19	7,145	41¾	42	125	18	23	6,731	39	39	117
12	20	3,393	19½	20	58	19	23	7,105	41¼	42	124
13	20	3,676	21	21	63	20	23	7,479	43⅜	44	130
14	20	3,958	22⅝	23	68	21	23	7,853	45½	46	136
15	20	4,241	25	25	75	22	23	8,227	47⅝	48	143
16	20	4,524	26¾	27	80	23	23	8,600	49¾	50	149
17	20	4,807	28	28	84	24	23	8,974	51⅞	52	155
18	20	5,089	29⅝	30	89	25	23	9,348	54	54	162
19	20	5,372	31¼	32	94	26	23	9,722	56	56	168
20	20	5,655	33	33	99	27	23	10,096	58¼	59	175
21	20	5,938	34½	35	103	12	24	4,886	28½	29	85
22	20	6,220	36	36	108	13	24	5,293	30¾	31	92
23	20	6,503	37½	38	113	14	24	5,700	33	33	99
24	20	6,786	39⅕	40	118	15	24	6,107	35½	36	106
25	20	7,069	41	41	123	16	24	6,514	37¾	38	113
26	20	7,351	42⅝	43	128	17	24	6,922	40	40	120
12	21	3,741	21⅛	22	64	18	24	7,329	42½	43	127
13	21	4,052	23¼	24	70	19	24	7,736	44⅝	45	134
14	21	4,364	25⅓	26	76	20	24	8,143	47	47	141
15	21	4,676	27¼	28	82	21	24	8,550	49½	50	148
16	21	4,988	29	29	87	22	24	8,957	51¾	52	155
17	21	5,299	30⅞	31	92	23	24	9,364	54	54	162
18	21	5,611	32⅝	33	98	24	24	9,772	56⅓	57	169
19	21	5,923	34½	35	103	25	24	10,179	58¾	59	176
20	21	6,235	36¼	37	109	26	24	10,586	61	61	183



FUMIGATING SMALL TREES FOR SCALE.

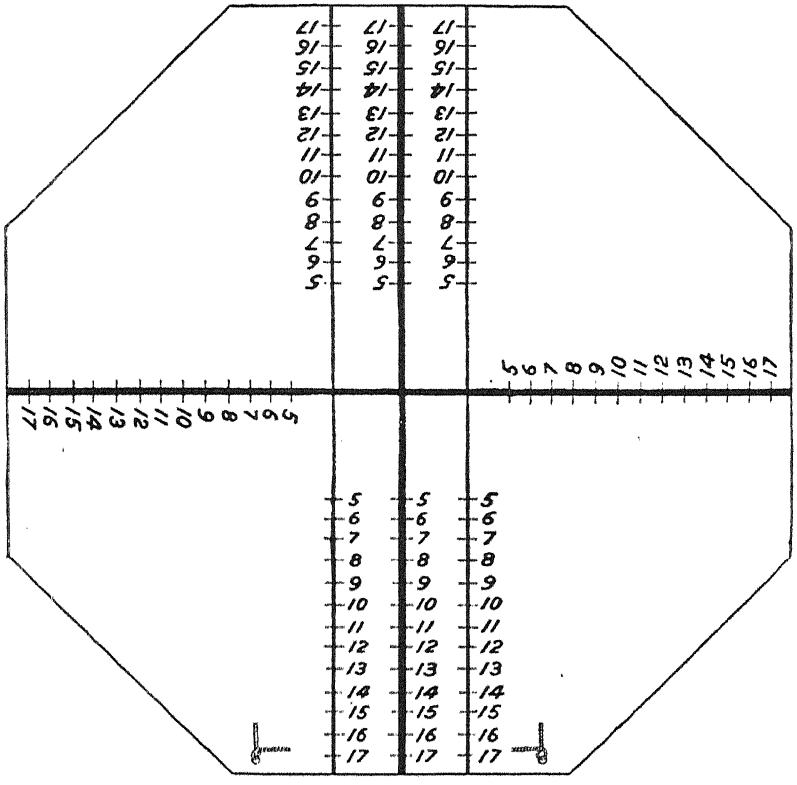
1. Framework of small box-tent. 2. Placing box-tent over tree. 3. Outfit for preparing fumigating ingredients.

The Morrill Method.

A great deal of work has been done by different investigators in the United States of America, among the most useful being the invention, by Dr. A. W. Morrill, of a method of calculating exactly the cubic capacity of tents.

The following is extracted from Bulletin No. 90, Bureau of Entomology, U.S. Department of Agriculture, by Mr. R. S. Woglum :—

In the accompanying figure is shown an outline of a regulation fumigation tent marked after the Morrill system. Three parallel lines and one line at right angles to them are indicated on the tent. The middle one of the three parallel lines passes through the central point in the tent canvas, running lengthwise of the central section or strip of



A Fumigation Tent marked after the Morrill method.

which the tent is made, and passing over the top of the tent from the edge on one side to the edge on the opposite side ; these lines also run in the direction in which the tent should be pulled on or off a tree. Beginning at the centre, these lines are graduated in feet towards either edge of the tent, after the manner shown in the diagram. For tents above 36 feet (average size) it is unnecessary to commence the graduation nearer than 5 feet from the centre of the canvas. When one of these lines is over the middle of the tree the distance over can be calculated by merely adding together the two numbers on the opposite sides of the tent, where the edge touches the ground. For instance, suppose that on the line over the centre of the tree 12 is nearest the ground on one side and

15 on the other. The distance over the centre of this tree would be the sum of these numbers, which is 27 feet. With the lines graduated after this manner, it makes little difference in determining the distance over the top of the tree whether or not the geometrical centre of the tent is at the centre of the tree, the single requirement being that some part of one of the graduated lines approximates the centre of the tree.

The two lines running parallel to this central line should be about 4 feet distant from it in the larger fumigating tents. The reason for using these auxiliary lines is, that in practice the centre of the tent is very often pulled considerably to one side, especially in covering small trees. If the middle line does not fall immediately over the centre of the tree one of the other two lines is quite likely to do so, and that one should be used in obtaining the distance over.

The cross-line running at right angles to the three parallel lines also passes through the centre of the tent, and is marked like the others. The idea of this cross-line is that in case of an irregularly-shaped tree the distance over can be taken in two different directions, and the average taken for use in determining the cubic contents. For experimental purposes with a few tents this line is an advantage, but in practical operations it is unnecessary and should never be placed on the tent, as measurement over the top in one direction is sufficient. The presence of so many lines tends to confuse the operator.

Having calculated the volume of a tree from the two measurements, around and over, it is possible to dose the tree at any strength desired. When the dosage has been determined, the chemicals are measured out and placed underneath the tented trees.

Leakage of Gas.

One of the most important questions relating to the proper dosage in fumigation is that of leakage of gas through the tent. In fact, with the present character of tenting, where the gas has usually all escaped by the end of an hour, the dosage depends directly on the amount of this leakage. In figures which approximate a citrus tree in shape, the volume decreases at a more rapid rate than does the surface. Computation shows that a tree 20 feet around by 12 feet over has 0·86 of a square foot of tent surface for each cubic foot of gas within to escape through, whereas a tree 79 by 54 feet has only 0·22 of a square foot of tent surface for each cubic foot of gas to escape through. This would mean that there is about four times as great an opportunity for leakage, or that the leakage would be approximately four times as rapid in the smaller tent as in the larger one. There can be little doubt that the leakage of gas through most of the tenting materials used in this State is nearly in accordance with these figures. In order to secure uniformity of results, this leakage must be taken into consideration, and small trees must receive more cyanide to 100 cubic feet than the larger trees. The correctness of the foregoing statement has been repeatedly demonstrated during the work in the field. Reference to the leakage of gas through tents was first made by Professor Woodworth, University of California, and in a recent publication Dr. A. W. Morrill, of the United States Department, has given it a very thorough treatment.

Dosage Schedule.

After having performed a large number of experiments against the purple scale, and determined the dosage required to destroy this insect on different sized trees, the writer (Mr. R. S. Woglum) utilised these results in preparing a schedule of dosage to be used in fumigation. This schedule (accompanying) has been designated "Dosage Schedule No. 1." The dosages used in this schedule are entirely original with the writer, being the result of experimental work supplemented by calculations, as explained in the following paragraphs. After the dosages were determined they were introduced into a chart of the same general form as that used by Dr. Morrill. Such a chart form has been known in scientific work for many years and was first introduced into fumigation scheduling by Professor Woodworth.

An average-sized orange tree, one 41 feet in circumference by 28 feet over, was taken as a basis in the preparation of the schedule. The cubic contents of the tree was determined and a dosage calculated which would give it 1 ounce to each 100 cubic feet. Trees of other dimensions, both larger and smaller, were then considered and their contents determined. In working out the dosage for these other trees not only was the cubic contents taken into consideration, but also the rate of leakage as compared with that of the tree 41 by 28 feet in size. Trees which were smaller than this would have a greater proportional leakage rate, while the larger ones would have less, as explained above. In securing the dosage for various trees, those smaller than 41 by 28 were given

sufficient cyanide in excess of 1 ounce per 100 cubic feet to offset the increased leakage, while the dosages for larger trees were proportionately decreased below the 1-ounce rate. This allowance for leakage so modified the schedule that some of the smaller trees were receiving in excess of 1½ ounces per 100 cubic feet, while trees as large as 60 by 44 were receiving only about three-fourths of an ounce to the same space. It thus can be seen that each dosage was worked out independently and so correlated to the other dosages that when placed in Schedule No. 1 the ultimate result was that of a schedule which should approximate uniform results throughout.

How to Use the Chart.

Referring again to the dosage schedule, the top line of numbers, commencing at 16 and continuing up to 68, represents the distance, in feet, around the bottom of the tent. The outer vertical columns of numbers, on either side, commencing at 10 and increasing regularly to 49, represent the distance, in feet, over the top of the tent. The dosage of a tree of known dimensions is found in that square where the vertical column headed by the distance around the tree intersects the horizontal line of figures corresponding to the distance over. For instance, in the case of a tree 40 feet around by 28 feet over, in the top line of numbers 40 is next after the third heavy vertical line. The dosages computed

DISTANCE AROUND, IN FEET.

DISTANCE OVER, IN FEET.

	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	
10	2	2	2	2	2																							10
12	2	2	3	3	4	4																						12
14	3	3	3	4	4	4	5	5	5	5	5	6																14
16	3	3	4	4	5	5	5	5	5	5	6	6	6	7	7													16
18	3	4	4	5	5	5	6	6	6	6	6	7	7	7	8													18
			20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	
20			4	5	5	6	6	6	6	7	7	8	8	8	9	9	10	10										20
22					6	6	6	7	7	7	8	8	9	9	10	10	10	11										22
24						6	7	7	8	8	8	9	10	10	11	11	12	12										24
26							7	8	8	9	9	10	11	11	11	12	13	13	13	14	15	15						26
28								8	9	10	10	11	11	12	12	13	14	14	14	15	16	16						28
								30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	
30								9	10	11	11	12	12	13	13	14	15	15	15	16	17	18	18	19	20	21	21	30
32											12	13	13	14	15	16	16	16	17	17	18	18	19	20	21	21	22	32
34												13	14	15	16	17	17	18	18	19	19	20	21	21	22	22	23	34
36												14	15	16	17	17	18	19	20	20	21	22	22	22	23	24	25	36
38													16	16	17	18	19	20	21	21	22	23	23	24	24	25	26	38
													40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	
40													16	17	18	19	20	20	21	22	23	24	24	25	26	26	27	40
41														18	19	20	20	21	22	23	24	24	25	26	26	27	28	41
42															20	20	21	22	23	24	25	25	26	26	27	28	28	42
43																21	22	22	23	23	25	25	26	26	27	27	28	29	43
44																		23	23	25	26	26	27	27	28	29	29	44
																		50	52	54	56	58	60	62	64	66	68	
45																		23	25	26	26	27	27	28	29	30	30	45
46																		24	26	26	27	27	28	29	29	30	31	46
47																		24	26	27	27	28	29	29	30	31	32	47
48																		25	26	27	28	29	29	30	31	32	32	48
49																		25	27	28	28	29	30	30	31	32	33	49

Dosage Schedule No.1 .

Prepared by Mr. R. S. Woglum, Bureau of Entomology, U.S. Department of Agriculture.

for trees 40 feet around are to be found in the vertical column headed by this number, which commences with 7 and ends with 16. Then the vertical column of large figures at either margin is followed down until 28 is reached. All dosages computed for trees 28 feet over are found in this horizontal line of figures, which commences with 8 and ends at 16. The dosage for a tree 40 by 28 feet is found at the intersection of this line with the vertical column headed with 40, that number being 11 — the required dosage of cyanide in ounces. Before the numbers 20, 30, 40 and 45 in the lines at the right and left margins are to be found blank spaces, and in the horizontal lines corresponding to these the numbers at the top of the chart are repeated in that part of the chart containing dosage figures. These numbers, repeated in this manner, make it easier for the eye to locate with certainty the dosage figures sought. In the chart used by the writer (Mr. Woglum) the figures representing distances around and over are printed in red. The lines bounding these colums of figures are also red. All the rest of the lines and figures are black.

The writer does not maintain that this table is accurate to the minutest part of an ounce for every dosage, but that such variations as do exist are so small that in practical work in the field the results in killing scale insects will be found uniformly satisfactory throughout. Two years of experience with the outfits belonging to this investigation, as well as with many practical outfits, in which work thousands of acres have been fumigated, have proved that this belief is well founded.

Cost of Fumigation.

In carrying out my fumigating experiments I have used the quantities given in No. 1 fumigating table, which I compiled first, and which has given excellent results.

The majority of trees in our orange-growing districts are what in many orange-growing countries would be called dwarf trees, therefore only medium to small size tents are required to cover them, and it will, therefore, be seen that the cost of handling the tents is not very great, as they do not require to be swung with tackling as do the larger ones, and in consequence fumigating citrus trees in this country will never cost as much as in California or Florida, where trees grow to a very large size.

In a series of experiments carried out at Galston a few years ago by the Department of Agriculture various sprays were tried, and the results were published. At the Hawkesbury Agricultural College orchard several sprays were again tried side by side with fumigation. As at Galston, the blue-oil and resin wash gave the best results; the fumigation, however, did the best work of all, and we, therefore, decided to use the latter means of combating the scale in this orchard. Hereunder is given the actual cost incurred in the treatment of 275 trees at one of the Government orchards, and I might say that, in the case of each tree, the quantity of cyanide and sulphuric acid was accurately registered. Occasionally I have found a live scale or two where the leaves or fruit have pressed hard against the tent, but wherever the leaves are hanging clear it is very seldom that a live scale can be found if the tree has received a sufficiently strong charge of cyanide. If, on the contrary, the charge has not been strong enough, it does little or no damage, and the scales continue to breed and spread as though the tree had not been treated.

As I mentioned before, 275 trees were treated, and the average cost per tree was 4½d., made up as follows:—

15	trees	which took	less than	1 oz.	each of	cyanide and	sulphuric acid.	
34	,,	,,	more than	1 oz.	,,	,,	,,	and less than 2 oz.
80	,,	,,	,,	2 oz.	,,	,,	,,	,, 3 oz.
120	,,	,,	,,	3 oz.	,,	,,	,,	,, 4 oz.
25	,,	,,	,,	4 oz.	,,	,,	,,	,, 5 oz.
1	,,	,,	,,	5 oz.				

In all it took 715¼ oz. of cyanide at 1d. per ounce, and a like quantity of sulphuric acid, at 2d. per pound; making for the former £2 19s. 6d., and for the latter 7s. 6d., or £3 7s. for the chemicals. The work was done at odd times, but occupied, when computed, two whole days for three men, which at 6s. per day makes £1 16s., or a sum of £5 3s., as the total cost of labour and chemicals for fumigating 275 trees.

Owing to the fact that we had only eight tents, the labour cost more than it would have done had we had a sufficient number of tents to have kept the men going all the time. A record of chemicals used per tree was kept, and the full quantities of cyanide and sulphuric acid used have been charged for at highest market rates, so that 4½d. per tree covers all the cost incurred, and can be taken as the outside cost of fumigating an orchard of this size.

The one treatment will, I consider, keep the trees free from scales of all kinds for one year, together with all fruits grown on them.

There are very few growers now-a-days who are not acquainted with the cost of spraying; some with good, while many have had very indifferent, results. Whether it is because they have not mixed their sprays properly, or because they have become disheartened and condemn spraying when they have found that one application did not clean their trees, I cannot say. Others claim that they have given the best sprays a fair trial, and still the trees are dirty and the fruit also. To all growers, therefore, I can with confidence recommend fumigating, and from my own experiments can affirm that it has kept the trees free from scales during the whole season, and, in consequence, the fruit was fit to send on to any market without fear of its being condemned, and the owner losing thereby.

I have given these details in order that those interested may have an idea of the actual cost of the work, and will thus be in a position to judge for themselves which course to follow (spraying or fumigating) for the destruction of all scales on citrus and other trees.

I may say that the largest tent used on the largest tree was 16 feet high and 34 feet circumference.

Liming a Growing Crop.

Without knowing something of the soil it is difficult to say what are the benefits that will be derived by the use of lime; but as a rule, soils on the North Coast do benefit by its application. At the same time, I do not think it would be advisable to apply lime to a growing crop of maize, and I should therefore not be inclined to advise the application of lime until the grass seed sown among the maize has obtained a strong stand; then top-dress the grass with it. Information as to the method of application, quantity, &c., is contained in Bulletin No. 16.—Geo. Valder.

Agricultural Bureau of New South Wales.

Branch.	Honorary Secretary.
Albury	Mr. J. D. Lankester, Albury.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Beckom	Mr. S. Stinson, Beckom.
Bonville	Mr. H. B. Faviell, Bonville.
Bungalong	Mr. E. Hughes, Oakleigh, Cowra Road, *viâ* Cowra.
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Carlingford	Mr. D. K. Otton, Carlingford.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coreen-Burraja	Mr. H. Vickers, Coreen, *viâ* Corowa.
Cowra	Mr. E. P. Todhunter, Cowra.
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Dunedoo	Mr. G. E. Alexander, Dunedoo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. Duffy, Henty.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Kareela	Mr. L. Haydon, Kareela.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit.
Kellyville	Mr. C. F. Boughton, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Portland	Mr. G. Gosper, Lower Portland.
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Milbrulong	Mr. O. Ludwig, Milbrulong.
Moruya	Mr. P. Flynn, Moruya.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
New Italy	Mr. F. A. Morandini, New Italy.
Nimbin	Mr. J. H. Hutchinson, Nimbin.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose	Mr. L. Pieremont, "Vila," Penrose.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Spring Hill	Mr. J. A. Henry, Spring Hill.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Tallawang	Mr. J. E. Hansall, Tallawang.
Toronto	Mr. J. G. Desreaux, "Esmond," Toronto.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and Honorary Secretaries are invited to

forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th, to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the Branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Samples of Wheat.

It has been decided to supply branches of the Agricultural Bureau, free of charge, with samples of grain and bunches of heads of the twenty-two varieties of wheat recommended by the Department for cultivation in various parts of the State. These comprise the leading varieties recommended for grain, hay, dual purposes, and green fodder. The collection should prove a valuable acquisition, especially for identification purposes, to members of branches in wheat-growing districts.

Branches intending to avail themselves of this offer should now do so without delay, by making application to the Department through their Honorary Secretaries.

Proposed Conference of Delegates from Branches of the Agricultural Bureau.

Honorary Secretaries who have not yet replied to the circular inviting members of branches to express an opinion *re* the advisability of holding a conference of delegates at Easter are requested not to delay this matter any longer.

NOTES AND REPORTS FROM BRANCHES.

Albury.

Mr. J. G. R. Bryant, Assistant Fruit Expert, delivered a lantern lecture on "Fruit Culture" in the Mechanics Institute Hall, Lavington, on Friday, 20th December, 1912.

Coonabarabran.

The fourth general monthly meeting of the above branch was held in the Shire Hall on the 7th December, with a good attendance of members present.

Subjects for the next meeting were selected as follows:—(1) Mr. D. Cameron promised to prepare and read a paper on "Lamb-raising combined with Mixed Farming." (2) Mr. H. W. Copeland promised to read a paper on the winter fodder crops more suitable for this district.

Stack-Building.—Mr. D. Hagan gave a practical demonstration with miniature sheaves, of how to build square and round stacks. He impressed upon members the necessity of keeping the centre full and higher than the outside layers, and the danger of a slip if the builder walked nearer the edge than the binder sheaves. The loose placing of the outside sheaves as against the old style of close packing them with the knee was explained. Mr. Hagan commenced the demonstration by placing the centre sheaves, butts to centre, forming a cross, then packing in the first course, all butts inwards; the outside sheaves were laid loosely, butts outwards, and the outside sheaves of each course were laid a little further out than the previous one; this method is followed up to the eaves. The demonstrator pointed out that if the outside sheaves were packed too closely, or the centre allowed to get lower than the outside sheaves, the stack, when settling, would press the butts of the outside sheaves up, and so allow any rain on the sides of the stack to penetrate into it and probably ruin the whole stack; if a builder found that this had occurred he recommended that a course of the outside sheaves be pulled out, and Mr. Hagan said that even two or more may be pulled out without fear of damage to the stack.

Forest Creek.

The usual monthly meeting of this branch was held on the 7th December. The business was a discussion on "The best time of the year for Lamb-raising."

All those present took part in the discussion, and whilst one or two favoured early lambs—May and June—the majority were against that idea, as the seasons are so uncertain that early lambing generally means heavy losses, both of lambs and ewes. To carry such a course out successfully much hand-feeding would have to be resorted to; it was considered that the expense involved would not be justified by the results.

Inverell.

The annual meeting of this branch was held on the 21st December, when the following office-bearers were elected for the ensuing year:—Mr. F. A. Lewin, Chairman; Messrs. P. H. Arkinstall and J. Ditzell, Vice-Chairmen; Mr. J. Ditzell, Treasurer; Mr. W. A. Kook, Secretary.

In order to identify noxious weeds in this district, it was moved that each member be requested to bring to the meeting one or more specimens for identification, as opportunity offers.

This is a step in the right direction; all other branches should follow this example. If the specimens cannot be identified locally, they should be sent to the Department for identification. If mounted on boards or cardboard and hung in the meeting-room of the branch they are sure to become a source of interest and education to members.

Kareela.

A lecture on "Poultry" will be delivered by Mr. Bradshaw, Poultry Expert, to members of the Kareela branch on the 11th inst.

Kellyville.

The Apiculturist, Mr. R. G. Warry, will give a lecture during this month, on "Beekeeping," to members of this branch, on a date to be fixed.

Leech's Gully.

The monthly meeting of this branch was held on 18th December. After the usual business a debate ensued, the subject being large farms and small farms for the district. After the matter had been debated thoroughly, a vote was taken to test the feeling of members. The majority of those present was in favour of small well-worked farms.

On the experiment plots on Mr. J. Chick's farm, Tenterfield, Mr. A. H. E. McDonald, Inspector of Agriculture, delivered a lecture to members of the Leech's Gully Branch of the Agricultural Bureau on the 17th December. During his lecture Mr. McDonald explained the farming system practised by the Department of Agriculture.

Maize and Potato Experiments.—These experiments, Mr. McDonald said, are established not merely to demonstrate that one variety is better than another, but to show how the best results can be obtained from a particular crop on the soil in use.

In raising a crop, consideration must be given to the following points:—

1. Cultivation.
2. The selection of the right kind of fertiliser.
3. The use of the right quantity of fertiliser.
4. The selection of the variety.
5. The sowing of the crop.

Cultivation requires the most careful attention on the part of the farmer. It is of more importance than manuring, because it not only makes fertilisers more effective, but it also, in itself, renders the soil more fertile, because of its ameliorating effects. Beside its effect upon the fertilising materials existent in or applied to the soil, it is of supreme importance in regulating the supply of moisture to the plant.

All soils, even the poorest, contain fairly large quantities of plant-food. A soil is poor because it is unable to supply to the plant the small quantities of soluble plant-food material required by that plant whilst growing A good crop of maize, for instance, will only require about 40 or 50 lb. of soluble phosphoric acid during its growth. The yield is poor when this amount is not forthcoming. The material is made soluble by different agencies, in each of which moisture is an essential part. Time is also an important factor, so that if the land is only moist for a short time only small quantities will be made soluble. So if the land is fallowed, and the moisture conserved for a period before the crop is sown, a store of soluble plant-food is prepared for the crop

Further, in nearly every district the rainfall is rarely sufficient to provide for the maximum needs of the crop whilst it is growing, after allowance is made for evaporation. A soil may be able to supply to a crop 30 lb. of phosphoric acid, when with a full supply of moisture it would need 40 lb. Through the deficiency of moisture, however, 30 lb. are all that is required, and a low yield results through lack of moisture. Fertilising under such circumstances would only be partly effective. By fallowing, a full supply of moisture is provided, and fertilising improves the yield considerably, whereas without it the yield would be small, through lack of fertilising elements.

All land should be prepared for a crop by ploughing a few months before the sowing time. The ploughing should be deep and thorough. After ploughing once, the land should be kept loose, and free from weeds by cultivating and harrowing.

After sowing, crops such as maize and potatoes should be thoroughly cultivated whilst growing. The first working should be done with the harrow. Generally speaking the harrowing should be given a short time after the crop has appeared above the ground. In some cases where rain falls immediately after sowing, the harrow can be used to advantage.

Fertilisers do not, as is supposed by some farmers, exhaust the land. As mentioned before, land contains large quantities of the fertilising ingredients. Crops take away a very small amount each year. The land is poor because it does not supply, in an available form, this small quantity. Each year about the same quantity becomes available, and fertilisers supply the crop what is not supplied by the soil. Without the fertiliser the crop would be poor; with the fertiliser it is improved. If fertilisers are used one year the crop will be better than that of the previous year, but if next year the fertilisers are not used the crop will be as good as it was before fertilisers were used.

Fertilisers will not cause crops to wither away in a dry time when they are properly used. Large quantities of the wrong class of fertiliser may force a crop to grow very rapidly, and to become soft and subject to drought. If the right quantities and the right kind are used, the crop will be in better condition to withstand drought.

The best fertiliser for maize on most classes of poor soil is one containing 3 parts dried blood, 2 parts bone-dust, 4 parts superphosphate, 1 part sulphate of potash. This might be applied at the rate of 1 cwt. or 1½ cwt. per acre.

The fertiliser should be applied with a drill at the same time as the seed. The most suitable fertiliser for potatoes is a mixture of sulphate of ammonia, 4 parts; superphosphate, 13 parts; and sulphate of potash, 3 parts. This should be applied at the rate of 4 cwt. per acre.

The best varieties of maize for Tenterfield are Early Yellow Dent and Funk's Yellow Dent, while the best varieties of potatoes are Early Rose, Satisfaction, and Queen of the Valley.

Lower Portland.

A special meeting of this branch was held on the 9th December.

Mr. R. Lowe read a paper on "The Horse," dealing with mating, selection of mares for breeding, treatment of foals, and breaking-in of young stock.

A question was asked as to whether the writer considered it advisable to handle foals from birth, and so have them under control when fit for work. The general opinion of the meeting was that unhandled foals would turn out better workers than those that had been handled from birth.

Mr. Lowe also dealt with the castrating of colts.

Mr. R. Wetherill promised to read a paper on "Tomato Culture" at the next meeting.

Nimbin.

A branch of the Agricultural Bureau has been formed at Nimbin. The following gentlemen have been elected office-bearers for the ensuing year:—Mr. F. G. Cullery, Chairman; Mr. J. H. Morrison, Vice-Chairman; Mr. John Wilson, Treasurer; Mr. J. H. Hutchinson, Secretary.

Sackville.

Mr. R. Camerini, manager for Dr. Fiaschi, read an interesting paper on "Potato Culture" to members of the above branch.

Mr. Camerini said: In dealing with this subject I propose to lay before you some useful information gained from personal experience here and in other countries, especially in Algeria and Spain, where potato culture is one of the most important industries.

Varieties.—The number of varieties of potatoes is endless, and in selecting his seed the grower must be guided by his own experience in choosing the variety best adapted for his particular district, and the purpose the crop is intended for.

For early varieties (eight to twelve weeks), I would recommend Early Rose, Triumph, and Royal Ashleaf Kidney; the last mentioned is a variety largely grown in Algeria. Royal Kidney is a very early sort, but not a prolific yielder. Snowflake is a good yielder, but its cultivation cannot be advocated in this district as it is very susceptible to disease. For medium sorts (eleven to thirteen weeks) I found Ruby and Coronation among the best for local production. For late varieties, Peerless, Brownell's Beauty, and Robertson's Giant are recommended.

Degeneration of Potatoes is a fact known to many growers; this is especially noticeable with varieties which have been grown continuously in the same district for a number of years. The principal causes of degeneration or deterioration are soil or climatic conditions unfavourable to the normal development of the plant, negligence in cultivation methods on the part of the grower, and especially the sowing of unselected seed.

Preparation of Soil.—The potato may be regarded as cosmopolitan in so far that it grows in practically every climate in nearly every class of soil. In this district the alluvial flats, where well drained, are eminently suited for potatoes. The light, sandy soils produce the earliest sorts and also the best quality tubers, but the heavier class of soil usually produces the largest crop. As the development of the roots requires a deep, loose soil, the ground must be ploughed and worked accordingly. On account of the deep ploughing necessary and the frequent cultivation which land receives, the potato may be classed as a crop which improves the physical and mechanical condition of the soil, being thus also responsible for the destruction of weed pests.

The land cannot be ploughed too deeply for potatoes; this should be done at the beginning of winter, and be followed by rolling and harrowing. The subsequent cultivation prior to planting the seed should be of a shallow character.

Manuring.—In new ground in this district little or no manure is required, but on land cropped for a number of years manuring is essential. Potatoes are heavy potash feeders, and also require generous proportions of nitrogen, phosphoric acid and lime.

For sandy soils rotted farmyard manure, ploughed in early in winter, will be found to be of great benefit if followed at time of planting with an application of artificial fertilisers containing potash and phosphoric acid. In heavy soils a few hundredweights of slacked lime applied some weeks before sowing will help to make the soil friable, and also assist in making certain essential plant-foods available.

The following mixture is recommended for heavy soils for this district:—1½ cwt. sulphate of potash, 2 cwt. superphosphate, 1 cwt. dried blood, per acre.

In light soils, as previously stated, farmyard manure or green manuring will greatly improve the fertility and physical condition of the soil, but of course plant-food must still be added at time of sowing seed, and the following is the mixture recommended for light soils:—1½ cwt. sulphate of potash, 2 cwt. superphosphate, 2 cwt. dried blood, 1 cwt. gypsum or lime, per acre.

Selection of Seed.—Too much care cannot be taken in the selection of seed. In some countries, such as France, Spain, and Algeria, it is customary to select large, clean, well-shaped tubers, and at planting-time cut them in two (lengthways), or else medium sized tubers are selected and planted whole. My experience is that small tubers, or small fragments of tubers, invariably give the lowest returns. Whole tubers of medium size are, in my opinion, the most suitable to plant.

Before planting, tubers should be carefully examined, and all those with very small eyes, abnormal characteristics, or signs of disease should be rigorously rejected. When cutting potatoes it is advisable to cut them lengthways.

Planting.—Planting may take place as soon as all dangers of frost are over. Drills should be opened with the plough, 3 to 5 inches deep, 3 feet apart. The sets should be planted about 1 foot apart in the drills, varying a little according to the habit of growth of the variety planted. The seed, if cut, should be placed with the eyes upwards and cut side downwards; this will facilitate the growth of the young shoots. Another practice which I found to be good is to let the tubers become green and allow them to sprout before planting, by exposing them to the light. In this way the eyes develop more normally, and produce stronger shoots than when planted in the ordinary way. It requires some practice to plant out these tubers without knocking the young shoots off, and of course, it takes considerably more time than planting cut seed, but a more accurate system of selection is assured, as only the strongest and healthiest tubers would be planted out; in such a way a supply of really good seed for future years can be counted on.

Intertillage.—The intertillage for potatoes is similar to that adopted for maize or tomatoes. The soil should be kept free from weeds, and the surface kept loose. The first cultivation should commence as soon as the rows become visible, and should be renewed whenever necessary. When the plants are about 10 to 12 inches high they may be hilled to a height of 2 or 3 inches. This operation is really of not much importance, but it keeps the tubers together and facilitates digging the crop. Nipping the flowers off usually increases the yield of the crop a little, but does not repay the expense.

Diseases.—The potato plant is subject to many diseases, the most common being early blight (*Macrosporium solani*), which is a fungus affecting the leaves and stalks, reducing the yield of the tubers considerably. Affected plants show greyish-brown spots on leaves. The remedy is to spray with Bordeaux mixture.

Late blight (*Phytophthora infestans*) appears in black spots on the surface of the leaf with fine white hairs underneath. The leaves and stem rot and the tubers are affected. The remedy is spraying the growing crop with 1 per cent. Bordeaux mixture.

Scab is another common disease with which most growers are unfortunately only too familiar. Preventive measures in selecting good healthy seed, and the dipping of the seed in a sulphate of copper or formalin solution for two hours previous to cutting, will be found to help materially in stamping this disease out.

Harvesting and Storing the Crop.—Potatoes intended for storing should be allowed to lie for a few days in a shed on a couple of inches of straw so as to allow them to dry; they may then be pitted, and should be covered with 2 feet of straw. Covering with earth induces conditions favourable to the development of various diseases.

Departmental Note.—Mr. A. J. Pinn states that in the experiments conducted by the Department it has been found that sulphate of ammonia is a better nitrogenous manure to use than dried blood. The mixture recommended by the Department is:—4 cwt. sulphate of ammonia, 13 cwt. superphosphate, 3 cwt. sulphate of potash; total, 1 ton. Of this mixture, 4 cwt. is applied per acre.

The use of formalin and sulphate of copper (bluestone) solution are mentioned for the prevention of scab. It is advocated (pending the results of experiments) to use formalin in a solution of 1 to 400, dipping for two hours, and if bluestone be used a 1 to 50 solution and dip for 15 minutes.

Wolseley Park.

At the meeting of this branch held on the 14th December, the following paper on *Phalaris commutata* was read by Mr. Bert Logan:—

Phalaris commutata is a native of South Africa.* This grass is most suitable for this

*Departmental Note.—*Phalaris commutata*, or *bulbosa*, is a native of Southern Europe.

district, as it will endure any amount of frost, and for this reason its cultivation should be more general in our district than is the case at the present time.

To obtain the best results from the cultivation of Phalaris it should be planted on low ground, because it requires a good deal of water, but it can also be grown to advantage on high land. The soil requires very little working before planting; it should be ploughed twice if it is new land. From my experience I consider the seed should be sown in the autumn, about the first rain in March. If drilled, it must be sown from 10 to 12 inches apart, with about 2 lb. seed to the acre, or 4 lb. broadcast; this would cost 20s. or 30s. per acre. If sown in March it would require to be eaten down by sheep when about 3 or 4 inches high to make it stool out, and it should not be allowed to go to seed the first year. By the end of October the roots should have grown to 6 inches in diameter, and the grass ought now be kept eaten down two or three times a week, as it will grow at the rate of about half an inch per day, or more, according to the soil and moisture conditions.

A small plot of *Phalaris commutata* has been growing in the garden for the last four years from one single root, obtained in Sydney, and planted during the month of April.

The following April it was dug up and separated into 250 plants, which were planted out in rows at 10 inches between the rows, and 8 inches between the plants. It was kept cut down till about the middle of August, and then let go to seed. By the end of December it was from 7 to 8 feet high; the seed was then ripe, although the stems and leaves were quite green.

The seed ripens very unevenly, and the only way to gather the best of it is to go round and shake the heads into a dish.

A discussion followed the reading of the paper, the object being to determine the two or three most suitable grasses to grow in this district for summer and winter respectively.

Members expressed a desire to know the difference between *Phalaris commutata* and Canary grass, especially the seed, and whether Canary grass was an annual or perennial.

Some members thought the seed of Canary grass to be very smooth, while that of the *Phalaris commutata* was inclined to be three-cornered and rough. Other members thought that while *Phalaris commutata* was perennial, Canary grass was an annual.

In reply to a question Mr. Bert Logan said that *Phalaris commutata* should be raised from roots, that it keeps green all the year round, and that stock are very fond of it.

Mr. W. A. Thornton said he did not think heavy stocking would eradicate it. He knew of 5 acres that were stocked the whole year round, and kept green throughout.

Mr. Bert Logan said it would grow on wet land, provided the water did not lie on the surface.

Mr. W. Eisenhauer said he preferred Sheep's Burnet to *Phalaris commutata*. During the last drought he carried two sheep to the acre on a patch of Sheep's Burnet, and when he took them off at the end of the drought, the sheep were fat.

Mr. T. Bagust said Poverty Bay rye grass was good in the winter. It grows quickly and soon establishes itself.

Mr. A. J. Sheehan said he considered Prairie grass, Cocksfoot, and Yorkshire Fog good winter grasses.

Mr. Garner thought Prairie grass was one of the best; it grew quicker than oats or any of the other varieties, but it would not stand heavy stocking. He thought it should be enclosed and fed off at intervals, or better still, mowed and fed as green stuff or hay.

Mr. Downie asked the best soil in which to grow Prairie grass.

Mr. Garner said the soil should be good and must be cultivated. The plants will not grow in uncultivated soil.

Mr. E. Woodhouse thought Cocksfoot was a good winter grass. It has been established in his paddocks for eight years, and is always stocked. He also thought Sheep's Burnet was a good winter grass.

Of the grasses mentioned as suitable in the winter, the majority of members present favoured *Phalaris commutata*, Sheep's Burnet and rye grasses as the three most suitable for the district.

Grasses mentioned as suitable for the summer were lucerne, the different varieties of clovers, Paspalum, *Phalaris commutata*, Perennial rye grass, and Sheep's Burnet.

Messrs. Bagust and Woodhouse supported lucerne. Mr. Woodhouse said it would grow well in the district, and could be cut three times.

Mr. Garner thought Perennial rye grass was good in the summer, because it would grow with very little rain.

Messrs. H. McEachern and B. Logan considered Paspalum to be a good summer grass. Once started it will establish itself; it grows luxuriantly, keeps green through the summer and autumn, and stock are exceptionally fond of it.

The three varieties, of those mentioned by members, and favoured by the meeting as suitable summer grasses, were, lucerne, clover, and *Phalaris commutata*.

DEPARTMENTAL NOTE.—In connection with the above, it is interesting to note the remarks of the Government Economic Botanist, Mr. E Breakwell. This gentleman says :—

There are four important species of Phalaris growing at present in New South Wales, viz. :—(1) *Phalaris bulbosa* (misnamed *Phalaris commutata* by some seedsmen); (2) *Phalaris cærulescens*; (3) *Phalaris minor*; and (4) *Phalaris canariensis*.

No. 4 is commonly called Canary grass. Both Nos. 3 and 4 are growing wild. They are annuals, and although providing a fair amount of winter feed, do not rank in importance as fodder grasses with *Phalaris bulbosa* or *Phalaris cærulescens*.

Nos. 1 and 2 are the two species grown under cultivation. Both provide large amounts of fodder, but as *Phalaris cærulescens* is an annual, *Phalaris bulbosa*, which is a perennial, is undoubtedly the better of the two.

Phalaris bulbosa has succeeded remarkably well at Glen Innes, Bathurst, Wagga, and Cowra Government Farms, and Hawkesbury Agricultural College. It is essentially a winter grass, but will remain green throughout the year in a climate like that of Glen Innes, which in some respects is similar to that of Tumberumba. At the other farms it remains green during the greater portion of the year, and it is only on the approach of very hot weather that it begins to wither off. As this branch of the Bureau suggests, planting by roots is the surest method of obtaining a stand. The leading seedsmen, however, are now stocking improved seed. It would pay growers of this grass to harvest their own seed from a good strain. It will stand a fair amount of dry weather, and will respond very quickly to rain. Other introduced grasses which should do well in Tumberumba district are the rye grasses (as the branch suggests), Cocksfoot, *Bromus inermis*, and Prairie.

Rye grasses.—Perennial rye grass is one well adapted to loamy stiffish soils, when it provides a fairly permanent pasture. At Glen Innes Government Farm this grass has been stocked for a considerable period, and still provides good feed. The improved types of Perennial rye now on the market are Poverty Bay and Western Wolths Rye.

Cocksfoot is a perennial. It has a strongly tufted habit of growth, is adapted to all classes of soils, and is particularly characterised by its rapid growth after being mown or grazed. It requires fairly heavy stocking, as it is inclined to become coarse if not kept down.

Bromus inermis (Hungarian Brome grass) does particularly well at Glen Innes, and should thrive in Tumberumba district. It will stand a large amount of dry weather, is a good fattening grass, and retains its verdure throughout the winter.

Prairie, as the Bureau suggests, is a good grass on rich soil. It will thrive remarkably well, given a fair amount of moisture. As this grass is an annual, care is required in stocking; it should be allowed to seed each year.

Yorkshire Fog is not a desirable grass to encourage, except in swampy or peaty soils. Stock have to acquire the taste, for it contains mucilage and sugar—not very palatable elements to cattle.

Sheep's Burnet is an all-the-year-round fodder plant, and, under favourable conditions, is a desirable plant to encourage. It is particularly characterised by its drought-resisting qualities.

Native grasses.—There are many native grasses which would do well in Tumberumba district. Amongst the most important are :—*Danthonia semiannularis* (Wallaby or White Top); *Chloris truncata* (Windmill grass); *Andropogon sericeus* (Queensland blue grass); *Andropogon pertusus* (Pitted blue); *Eragrostis Brownii* (Brown's love grass); *Eragrostis pilosa* (Weeping love grass); *Panicum effusum*.

Danthonia semiannularis (Wallaby or White Top) thrives remarkably well in the western, south-western, and southern tablelands. It is a particularly hardy grass, grows throughout the year, and is well liked by stock.

Chloris truncata (Windmill grass) is a favourite grass with sheep. Unfortunately it is a shallow rooter and requires light stocking.

Andropogon pertusus (Pitted blue grass) appears to thrive in the south-western districts better than anywhere else. In these districts, under stocking, it is a splendid turf-forming grass, standing a fair amount of dry weather, and at the same time responding very quickly to rain. There is no doubt that it is well liked by stock.

Andropogon sericeus (Queensland blue grass) is more upright in its habit of growth than Pitted blue grass. It is a very succulent grass, both for cattle and sheep.

Eragrostis Brownii (Brown's love grass) is a good stooler. It likes a fair amount of moisture to be at its best.

Eragrostis pilosa. Wherever this grass has been tried (Cowra, Glen Innes, and Nyngan) it has proved to be (*a*) a rapid grower, (*b*) a drought-resisting grass. It needs to be kept eaten down to be thoroughly appreciated by stock.

Panicum effusum. Like most of the Panic grasses, it is an excellent summer grass.

Small packets of seed of the above may be obtained from the Department for trial. Applications should be made to the Under Secretary.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

RHODES GRASS FOR THE NORTH-WESTERN SLOPES.—"J.C.": Rhodes Grass is suitable for your district. It should be sown at the rate of 4 lb. to 6 lb. per acre, as early in the autumn as weather conditions will admit.—GEO. VALDER.

CHERRY TREES "GUMMING."—"H.S.M.G.": Cherry trees "gum" from a variety of causes, and some varieties are more susceptible than others. Unsuitable soils, especially poorly drained soils, droughty conditions, severe frosts, cold, dry winds, varying climatic conditions, such as sudden changes of temperature, all cause gum to exude. Treatment is carried out in the spring when the trees are cut with a knife, by running a slight incision from the stem on to each of the main limbs. All gum should be cleaned away and the wounds dressed with a thin application of white lead and oil. This removal of gum spots and dressing with white lead and oil can be done at any time in the year.—J. G. R. BRYANT.

BOOK ON VETERINARY SURGERY.—"P.V.G.P.": There are no books on veterinary surgery for purely Australian conditions, but the one which would suit best would be "Veterinary Notes for Horse-owners," by the late Captain Hayes.—VETERINARY OFFICERS.

OPHTHALMIA IN CATTLE.—"R.H.P.": Bathe the eyes with a saturated solution of boracic acid in water, and put in a few drops of a solution of hyposulphite of soda 10 grains to 1 ounce.—VETERINARY OFFICERS.

RUTHERGLEN BUGS ON TREES.—"A.N.": Rutherglen bugs (of which yours are specimens) often damage stone fruits, and sometimes cause gumming by puncturing the skin with their tiny probosces. No surface spray is very effective; the best results have often been obtained by jarring the trees, after spreading oiled sheets or shallow galvanized iron trays covered with oil below the trees. The work must be done in the early morning when the bugs are sluggish and drop easily on the tree being shaken.—W. B. GURNEY.

BUGS IN THE HOUSE.—Fumigation with hydrocyanic acid in the strength recommended by Mr. Allen in this issue, No. 2 Table, for fumigating trees, would be fatal to bugs, but hydrocyanic acid gas is highly poisonous, and there is danger in inexperienced persons fumigating a house with it, so that it cannot be recommended. It would not injure clothes, pictures, or furniture. Food must be removed. Fumigation with 4 oz. sulphur burned in a dish is said to be effective, but probably the most practical way is to make liberal applications of benzine or kerosene, introducing it into all small crevices by the use of a small brush or feather.—A. A. RAMSAY.

HORSE PURGING ON AND OFF.—"J.W.S.": For a horse that has been purging on and off for several weeks, and that is going off in condition, though anxious to eat, it would be well to keep the horse off the grass. Mix a double handful of pollard in his feed daily, and have the following powders made up and given in a little feed before giving him his full feed: Opium 1 drachm, sodium carbonate 1 drachm, powered gentian 1 drachm; this is sufficient for one powder. If he will not take them in his feed the powders may be given as a drench in warm water, or in a little wheat-meal or oatmeal gruel.—VETERINARY OFFICERS.

TO MAKE TOMATO SAUCE.—"G.W.": The following recipe for making tomato sauce is taken from a book on preserving, by Dr. Jean Pacrette, of Paris: Boil two hours in an enamelled kettle, 100 lb. tomatoes, 1 lb. 2 oz. salt, ½ oz. bay leaves, ½ oz. cloves, 3 lb. onions. Press through a thin sieve if possible; the sauce must be thick. Seal tightly and process: Half pints, 15 minutes at 222 deg. Fahr.; pints, 20 minutes; quarts, 30 minutes, at same temperature. It is feared that without a retort this temperature cannot be obtained, but a trial might be made with a small quantity for a start.—W. J. ALLEN.

Orchard Notes.

W. J. ALLEN.

FEBRUARY.

Cultivation.

THIS work may still be continued to keep down weeds and retain the land in a state of tilth.

Re-working Old Trees.

The early part of this month is the best time to bud to better varieties all poor or worthless varieties of fruit-trees found growing in the orchard. Be sure that the buds to be used are taken from trees which have borne fruit of the very best quality. Insert them on the outer or underneath side of the limbs, where it will be found that the bark usually raises more easily than on the upper side, and where they are more apt to form a well-shaped tree than where the buds have been inserted on the upper or inner side of such limbs.

Codling Moth.

Wherever spraying has been thoroughly carried out, the Codling Moth has been kept under satisfactorily. In cases where the moth is prevalent, whether on sprayed or unsprayed trees, see that bandages are given careful and regular attention, and that all infested fruit is picked from the trees and ground, and destroyed by boiling or burning in accordance with the regulations under the Fruit Pests Act.

Pick up and destroy all fly-infested fruit.

Green Manuring.

Towards the end of the month arrangements should be made for sowing leguminous crops such as are required for green manuring, and as the fall and winter are the only seasons when such crops can be grown among the trees without robbing them of moisture, it is best to sow only such varieties as will make a fair growth during the cooler and cold months.

Such crops as grey field peas, tares, or combinations of rye and tares, or barley and tares, &c., are depended on to furnish nitrogen and organic matter to keep the soil in a high state of fertility.

Harvesting Fruits.

Harvesting of fruits will still be continued. Fruit for export will be ripe enough for picking and packing towards the end of this month or early in March. Send only the very best fruit. It should be well coloured, a good

size, evenly graded, and neatly wrapped and firmly packed. The fruit should be picked and handled carefully in order to avoid bruising, and should be kept as cool as possible from the moment it is taken from the tree until it is stored in the boat for carriage to Europe. Use good, strong, clean cases for holding the fruit, and have them stencilled neatly and legibly—as anything is not good enough, but only the very best.

Processing Fruits.

Can, dry, and convert into jam all surplus fruits. Fruit for drying purposes promise to be late in ripening this year, and unless we get a good spell of dry, hot weather in the autumn, sultana and raisin growers may again find some difficulty in curing their fruit. It would be well, therefore (as an insurance), to make some preparation for evaporating them, should the weather conditions prove unfavourable for sun-drying. Any hot room where the air circulates freely will serve the purpose for finishing off the fruits, provided it can be first fairly well dried in the sun. Leaflets dealing with this work may be had free on application.

Red, Brown, and Indian Wax Scale on Citrus Trees.

Trees may be either fumigated or sprayed for the destruction of scale insects. This work may be carried out this month, provided the trees are in good strong condition, but as this is usually a very hot month the work will have to be done on cool days or at night, but never fumigate during the heat of the day at this time of the year.

Pamphlets dealing with fumigation and sprays for scale insects on citrus fruit may be secured gratis on application to the Department.

Acknowledgments.

I have to acknowledge receipt of samples of the "Excelsior" apple from Mr. W. B. Stokes, Galston. This variety follows Carrington. I consider it is only valuable on account of its season.

Non-Delivery of the "Agricultural Gazette."

It is requested that complaints with regard to the delivery of the "Gazette" be addressed to the Government Printer, Sydney, from whose office the despatching is done. Letters on this subject which are addressed to the Department of Agriculture have to be referred to the Government Printer for attention, so that actually time will be saved if the request is observed.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull	Sire	Dam.	Stationed at—	Engaged up till—
Irish Shorthorn.	Limerick Lad (imp.)	... .	... .	Berry	*
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (im.)	Wollongbar Farm	*
,, ...	Imperialist ...	Florio	Lady Nancy of Minembah.	,, ,,	*
,, ...	March Pansy ...	Earl March .	Australian Pansy	Grafton Farm ...	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
,, ..	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	,, ,,	*
,, ...	Elaine's Heir ...	Thessalian II ...	Wagga Elaine	Yanco Farm ...	*
,, ...	Jamaica Jack ...	Sir Jack ...	Rum Omelette (imp.).	Wollongbar Farm	*
,, ...	Royal Blood ...	Berry Melbourne	Calceolus ...	,, ,,	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie .	Berry Farm ...	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Cowra Farm ...	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Swan Bay... ...	22 June, '13.
,, ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Kyogle	28 Aug., '13.
,, ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Grafton Farm ...	†
,, ...	Prince Souvia ...	Vivid's Prince...	Souvenir (imp.)	Grafton	3 April, '13.
,, ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Casino	22 June, '13.
,, ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '13.
,, ...	Sunshine ..	King of the Roses	Princess Vivid	Grafton Farm ...	*
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	Claudius (imp.)	Golden Star II..	Claudia's Pride (imp.).	Tweed River ...	12 Aug., '13.
,, ...	Trengwainton VillageFavourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
,, ...	Good-bye ...	Western Duke...	Souvenir (imp.)	Casino	28 May, '13.
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Jones' Island ...	1 June, '13.
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (im.)	Pambula	1 May, '13.
,, ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Lismore	3 July, '13.
,, ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	10 Nov., '13.
,, ..	Prince of Warren Wood (imp.).	Kingsmoor Governor (1952)	Quail (7051)	Frederickton ...	1 May, '13.
,, ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Macksville ...	14 June, '13.
,, ...	Rosehill (imp.)..	Northesk (2073)	Faultless Footsteps (6132)	Raymond Terrace	19 June, '13.
,, ...	Duke of Orleans	Godolphin Arthur (1664)	Flower of the Preel 3rd (imp.)	H.A. College, Richmond	*
Ayrshire ...	Jamie's Heir ...	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ...	*
,, ...	Orphan Boy .	Songster of Greystanes.	Rosamond ...	Glen Innes Farm..	*
,, ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A. College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin (imp.)	Bratha 4th ...	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.

Department of Agriculture,
Sydney, 3rd February, 1913.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

SHORTHORN.—Duke of Hampton: sire, Royal Hampton 10th (imp.); dam, Flower Girl; calved 14th May, 1911; colour, red and a little white. Price, **£15.**

Flower Girl is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy. Australian Pansy is by Airy Knight 2nd from Pansy 4th (imp.).

Flower Girl, on second calf, in thirty-three weeks, gave 4,513 lb. of milk, with a test of 3·7 per cent. butter-fat, and is still milking well. Forest Pansy gave 5,785 lb. of milk in forty-one weeks, yielding equal to 272 lb. of butter. Australian Pansy gave 5,822 lb. of milk on her first calf, with an average test of 3·8 per cent. butter-fat.

GUERNSEY.—Belfast: sire, King of Roses (imp.); dam, Flaxy 2nd; calved 20th September, 1911; colour, lemon and white. Price, **£40.**

Flaxy 2nd is by Rose Prince (imp.) from Flaxy (imp.). Flaxy (imp.) in thirty-seven weeks gave 6,443 lb. of milk, which it is estimated produced 334 lb. of butter. Flaxy 2nd developed a habit of sucking herself, and the only record shows 3,333 lb. of milk, testing 5 per cent.

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—St. Michael of Wollongbar: sire, Trequean Mike (2103); dam, Polly 2nd of Roque Balan (imp.); calved 21st August, 1911. Price, **£40.**

Polly 2nd of Roque Balan (imp.) yielded 4,157 lb. of milk, equal to 235 lb. of butter.

***Earl of Bath:** sire, Monsieur Beaucaire; dam, Miss Jasmine; calved 10th December, 1911. Price, **£35.**

AYRSHIRE.—Old Jock: sire, Jamie's Heir; dam, Auchen Dandy; calved 22nd November, 1911. Price, **£15.**

Auchen Dandy is by Daniel (imp.) from Dandy of Rattenraw (imp.). She yielded 4,273 lb. of milk on her second calf, equal to 216·5 lb. of butter.

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* This bull will be held until 21st instant, when, if more than one applicant, he will be balloted for.

AT WOLLONGBAR EXPERIMENT FARM—*continued.*

HOLSTEIN COWS FOR SALE.

WOLLONGBAR EXPERIMENT FARM.

Name.	Date of Birth.	Sire.	Dam.	Price.
				£
Lolkje Field (not in calf) ...	12 Nov., 1904 ...	Garfield	Lolkje	20
Marjorie (in calf)	5 Sept., 1906 ..	Chairman	Margaretha ...	30
Fraulein Arama (not in calf)..	4 Feb., 1907 ...	The Hague ...	Dina's Douwe ...	25
Marigold (not in calf) ...	25 Feb., 1907 ...	The Hague ...	Margosa	25
Maggie Hague (in calf) ...	28 Aug., 1907 ...	The Hague ...	Maggie Obbe ...	30

H. C. L. ANDERSON, Under Secretary.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1913.

Society.	Secretary.	Date.
Berry A. Association	... C. W. Osborne ...	Feb. 5, 6
Moruya A. and P. Society	... H. P. Jeffery ...	,, 5, 6
Alstonville A. Society	... W. M. Monaghan	,, 11, 12
Tamworth P. and A. Association	.... J. R. Wood ...	,, 11, 12, 13
Shoalhaven A. and H. Association (Nowra) ...	... H. Rauch... ...	,, 12, 13
Guyra P., A., and H. Association	... P. N. Stevenson...	,, 18, 19, 20
Cobargo A., P., and H. Society	... T. Kennelly ...	,, 19, 20
Ulladulla A. Association	... J. Boag	,, 19, 20
Nambucca A. and H. Association	... J. Egan	,, 20, 21
Wyong A. Association	... J. H. Kay ...	,, 20, 21, 22
Central Cumberland A. and H. Association ...	... H. A. Best ...	,, 21, 22
Dapto A. and H. Society	... J. H. Lindsay ...	,, 25, 26
Bangalow A. and I. Society	... W. H. Reading ...	,, 25, 26, 27
Armidale and New England P., A., and H. Assoctn..	A. McArthur ...	,, 25-28
Campbelltown A. Society	... F. Sheather ...	,, 26, 27
Gulgong A. and P. Association	... D. H. Spring ...	,, 26, 27
Gunning P., A., and I. Society...	... J. R. Turner ...	,, 26, 27
Manning River A. and H. Association (Taree)	... S. Whitbread ...	,, 26, 27
Tumut A. and P. Association	... T. E. Wilkinson...	,, 26, 27
Armidale and New England P., A., and H. Assoctn.	A. McArthur ...	,, 26-28
Inverell P. and A. Association	... J. McIlveen ...	,, 26, 27, 28
Robertson A. and H. Society	... J. D. Wood ...	,, 27, 28
Northern A. Association (Singleton)	... E. J. Dann ...	,, 27, 28, Mar. 1.
Nepean District A., H., and I. Society (Penrith)	... P. J. Smith ...	,, 28, Mar. 1.
Southern New England P. and A. Association, Uralla.	W. McCrossin ...	Mar. 4, 5
Mudgee A., P., H., and I. Association ...	...P. J. Griffin ...	,, 4, 5, 6
Tenterfield P., A., and M. Society	... F. W. Hoskin ...	,, 4, 5, 6
Cumnock P., A., and H. Association	... K. A. Abernethy..	,, 5

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1913.

Society.	Secretary.	Date.
Bega A., P., and H. Society	W. A. Zingel ...	Mar. 5, 6
Braidwood P., A., and H. Association...	L. Chapman ...	,, 5, 6
Bellinger River A. Society	J. F. Reynolds ...	,, 5, 6, 7
Camden A., H., and I. Society...	A. Thompson ...	,, 5, 6, 7
Tumbarumba and Upper Murray P. and A. Society...	E. W. Figures ...	,, 5, 6, 7
Newcastle A., H., and I. Association	C. W. Donnelly ...	,, 5, 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy ...	,, 6, 7
Port Macquarie and Hastings District A. and H. Society	T. Dick	,, 6, 7
Berrima District A., H., and I. Society (Moss Vale)	I. Cullen	,, 6–8
Blayney A. and P. Association	H. R. Woolley ...	,, 11, 12
Gundagai A. Society	A. Elworthy ...	,, 11, 12
Luddenham Agricultural Society	F. Shawe	,, 11, 12
Central New England P. and A. Association (Glen Innes)	G. A. Priest ...	,, 11, 12, 13
Narrabri P., A., and H. Association	D. J. Bridge ...	,, 11, 12, 13
Bombala A. Society	W. G. Tweedie ...	,, 12, 13
Molong P. and A. Association	W. J. Windred ...	,, 12
Macleay A., H., and I. Association	E. Weeks... ...	,, 12, 13, 14
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins ...	,, 12, 13, 14
Goulburn A., P., and H. Society	G. G. Harris ...	,, 13, 14, 15
Royal Agricultural Society, Sydney	H. M. Somer ...	,, 18–26
Coramba District P., A., and H. Society	H. E. Hindmarsh	,, 26, 27
Cooma P. and A. Association	C. J. Walmsley ...	April 2, 3
Coonabarabran P. and A. Association	G. B. McEwen ...	,, 2, 3
Bathurst A., H., and P. Association	J. Bain	,, 2, 3, 4
Hunter River A. and H. Association	E. H. Fountain ...	,, 2–5
Wauchope P., A., and H. Society	A. D. Suters ...	,, 3, 4
Cobar P. and A. Association	D. H. Dunlop ...	,, 5, 6
Adaminaby P. and A. Association	W. Delaney ...	,, 9, 10
Gloucester A., H., and P. Association	S. J. Bignell ...	,, 9, 10
Quirindi P., A., and H. Association	Geo. Fowler ...	,, 9, 10
Clarence P. and A. Society (Grafton)	G. N. Small ...	,, 9, 10, 11
Orange A. and P. Society	W. Tanner ...	,, 9, 10, 11
Dorrigo A., H., and I. Society	W. R. Colwell ...	,, 10, 11
Hawkesbury District A. Association (Windsor) ...	H. S. Johnston ...	,, 10, 11, 12
Moree P. and A. Society	D. E. Kirkby ...	,, 15, 16, 17
Batlow A. Society	Tom Bowman ...	,, 16, 17
Dubbo P., A., and H. Association	F. Weston ...	,, 16, 17
Dungog A. and H. Association	C. E. Grant ...	,, 16, 17
Merriwa A. and P. Association...	V. Budden ...	,, 16, 17
Ulmarra P. and A. Society	R. N. Shaw ...	,, 22, 23
Upper Manning A. and H. Association (Wingham) ...	D. Stewart, junr...	,, 23, 24
Warialda P. and A. Association	A. J. Devine ...	,, 23, 24, 25
Richmond River A., H., and P. Society	D. S. Rayner ...	,, 29, 30 May 1
Kyogle P., A., and H. Society	M. P. Dunlop ...	May 7, 8
Walgett A. Association	W. Neal	,, 21, 22
Deniliquin P. and A. Society	L. Harrison ...	July 17, 18
Murrumbidgee P. and A. Association (Wagga) ...	A. F. D. White ...	Aug. 19, 20, 21
Ariah Park P., A., H., and I. Association	J. N. Taylor ...	Sept. 2, 3
Manildra P. and A. Association	C. M. Podmore ...	,, 3
Germanton P., A., and H. Society	J. S. Stewart ...	,, 3, 4
Junee A. Association	T. C. Humphreys..	,, 3, 4
Young P. and A. Association	T. H. Tester ..	,, 9, 10, 11
Albury and Border P., A., and H. Society	W. I. Johnson ...	,, 9, 10, 11
Cootamundra A., P., H., and I. Association	T. Williams ...	,, 16, 17
Cowra P., A., and H. Association	G. S. Fisher ...	,, 16, 17
Murrumburrah P., A., and I. Association	J. A. Foley ...	,, 23, 24

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Agricultural Gazette of New South Wales.

Sheep and Wool for the Farmers.

REPORT ON THE SALE OF LAMBS' CARCASES, INCLUDED IN EXPERIMENTAL WORK, AND EXPORTED TO LONDON.

J. WRENFORD MATHEWS.

As indicated in previous articles in the *Agricultural Gazette*, the investigations of the Department have been so planned as to test the value of different breeds from two distinct standpoints—

(1) To ascertain the most valuable dual purpose wool, mutton, and early-maturing type;

(2) to determine which is the most valuable combination for export in the form of an early lamb.

It is with the latter phase of the question that we are here specially concerned. A wool and mutton breed obviously implies an animal marketable at a more advanced stage of its career, and disposed of more or less at a state of maturity. However, the demand of the lamb trade is limited, and calls for the carcase of a lamb of about 5 months; that is, one marketable off its mother.

Further particulars regarding the various points upon which information is being sought in the conduct of this experiment work will be found in former publications. In Bulletin No. 53, issued by the Department, and entitled "The Cross-breeding of Sheep," at page 68 appears a plan setting out details of the whole scheme in tabular form. The first table shows the breeds selected for mating with the Merino in the evolution of the wool and mutton combination; and the second gives similar information, but aims at regulating the use and testing the relative value of the progenies of the breeds included in Table I with the idea of raising the most suitable export lamb.

Before discussing individual merits or comparing the results, it is necessary to distinguish between "first" and "second crosses," for unless this is made sufficiently clear, confusion may ensue. The types included in the experiment work have been standardised, and definite and limited functions assigned to each. The tables furnish these important details. A brief review will show that the progenies detailed in Table I of the Bulletin include "first crosses"; while Table II in the same publication refer to the "second crosses." Further, a little study of the system of symbols, set forth on page 120 of the Bulletin, will amply repay the trouble in the additional light it throws on the question of breed and cross. As there defined the letter "M" always stands for

Merino. "L" indicates longwool; but to give expression to the idea of their order of classification of increasing fineness of fleece, body, weight, and early maturity, as exemplified in chapters III and V of the Bulletin, these initial letters are separated by numerals, which signify the relative positions assigned to the different longwools concerned. Thus, "L_1" stands for Lincoln, "L_2" for Leicester, "L_3" for Border Leicester, and "L_4" for Romney. The letter "D" denotes the Down sires, the members of this family being named in their order of increasing early maturity and body weight. The arrangement of the numerals and initial letters indicates their position in that order. "D_1" thus stands for the South Down, it being the head of that group; "D_2" for the Shropshire, "D_3" for the Hampshire, and "D_4" for the Suffolk. The Dorset Horn, although distinct, is included in this group, and its position may be conveniently defined by the use of the symbol "D_5." According to this arrangement of symbols, all "first crosses" are signified by the letters "LM." By adding to these the letter "D" there is completed the formula which, in a general way, gives expression to the "second cross."

The records of the essential preliminary standardisation, and the grouping of first and second crosses under distinct and separate heads constitute a progress report of the work up to date. It is interesting to contrast these particulars with those of a similar shipment last year, and to observe how the value of the lambs' carcases vary, in accordance with the physical characteristics of the breeds chosen for crossing purposes. The results are fairly consistent, and bear out all that has been written in relation to breeding and crossing.

The Carcases Exported.

The carcases exported numbered 238. They comprised both first and second crosses, and came from the Wagga, Cowra, and Bathurst Farms. A previous shipment, numbering 221, made the year previous, included only second crosses, and was from only one farm; but the two years' results are presented for comparative purposes.

*TABLE I.—Showing Average Live Weight, hot Dressed Weight, and cold Frozen Weight of different cross-bred lambs taken at Young for the experiments of 1910 and 1911.

1910.

Breeds of Lambs.	No.	Average Live Weight.		Average Dead Weight.		
		At Wagga Farm.	At Young.	Dressed.	Fat.	Frozen.
		lb.	lb.	lb. oz.	lb. oz.	lb. oz.
South Down-Lincoln-Merino ...	32	67	58	31 13	3 9	29 14
Shropshire-Lincoln-Merino ...	71	68	63	32 7	3 13	30 8
Hampshire-Lincoln-Merino ...	31	70	64	33 0	3 5	31 1
Dorset Horn-Lincoln-Merino ...	47	78	67	35 10	3 10	33 11
Border Leicester-Lincoln-Merino ...	40	71¼	62	33 0	3 0	31 6

* The tables for this article were compiled by Mr. H. J. Major.

Wagga Farm, 166 lambs.

1911.

Breeds of Lambs.	No.	Average Live Weight.	Dressed Weight.	Frozen Weight.
First crosses—		lb.	lb. oz.	lb. oz.
Lincoln-Merino	17	64	31 6	29 3
English Leicester-Merino	20	58	28 9	26 9
Border Leicester-Merino	17	65	31 7	29 4
South Down-Merino	7	55	27 10	25 11
Dorset Horn-Merino	7	63	31 8	29 5
Second crosses—				
South Down-Lincoln-Merino	28	66	35 9	33 1
Shropshire-Lincoln-Merino	14	67	34 1	31 11
Dorset Horn-Lincoln-Merino	21	74	38 0	35 5
Dorset Horn-Border Leicester-Merino	22	79	41 8	38 10
Border Leicester-Border Leicester-Merino.	13	74	38 11	36 0

Bathurst Farm, 30 lambs.

Mixed second cross lambs	18	67	36 0	33 8
Do do	12		34 4	31 15

Cowra Farm, 42 lambs.

First crosses—				
Lincoln-Merino	17	64	29 12	27 11
English Leicester-Merino	18	62	29 2	27 2
Border Leicester-Merino	7	53	26 7	24 9

The 1912 Drop.

Originally the intention was to make shipments, to contrast results, and to get the verdict of the London buyer each year during the progress of the experiment. The nature of the season, however, precluded that idea last year. No lambs raised at the Government farms during 1912 were fit to test the London market with, for practically at none of the farms where the experiments are being conducted did any rain fall during the first half of the year. The ewes, lambing on dry and scant pastures, were reduced to very low condition. This constituted a severe check on the lambs then being born, and one which they failed to recover from later on. Although the season improved considerably towards the latter part of the year they failed to make satisfactory progress. They were stunted, ill-shaped, and altogether unsatisfactory, and as a comparison of their body and fleece weights will show, were much below the average of previous years. As many as could be gathered together, and these coming only from the one farm—Wagga—after being shorn, were sold locally in their live state, in the Homebush market. A record of their body and fleece weights, together with the prices they realised, is appended in Table II.

TABLE II.—Showing the Average Body and Fleece Weight, also the returns from lambs sold locally, 1912.

Wagga Experiment Farm.

Cross.	No	Weight.		Fleece value at 9d. per lb.	Live Value.		Total Value.
		Body.	Fleece.		Gross.	Net.	
		lb.	lb. oz.	s. d.	s. d.	s. d.	s. d.
L_2M	15	56	1 15	1 $5\frac{7}{16}$	7 1	5 7	7 1
L_3M	8	57	2 2	1 $7\frac{1}{4}$	7 1	5 7	7 $2\frac{1}{4}$
D_1-L_1M ...	17	72	1 9	1 $2\frac{1}{16}$	8 10	7 4	8 $6\frac{1}{16}$
D_1-L_2M ...	15	72	1 10	1 $2\frac{5}{8}$	8 10	7 4	8 $6\frac{5}{8}$
D_2-L_1M ..	10	77	2 2	1 $7\frac{1}{4}$	9 0	7 6	8 $7\frac{1}{4}$
D_2-L_1M ..	3	...	.....	.....	7 1	5 7	7 $2\frac{1}{4}$
D_2-L_2M ..	14	76	1 14	1 $4\frac{7}{8}$	10 7	9 1	10 $5\frac{7}{8}$
D_5-L_1M ..	16	80	1 9	1 $2\frac{1}{16}$	10 7	9 1	10 $3\frac{1}{16}$
D_5-L_3M ..	10	76	1 7	1 1	10 7	9 1	10 2

Commission, cartage, yard dues and rail freight Bomen and Sydney—Total, £8 6s. Average expenses per lamb, 1s. 6·4d.

From this there is to be deducted the cost of shearing. This, done on the farm, would amount to about 5d. per head. The lambs were about 4 months old, or thereabouts, when shorn. There not being a sufficient quantity to offer the wool produced by each cross separately, it was bulked and sold in one line. It realised 9d. per lb., and gave an average return per lamb of 1s. 4d. for wool. The comparatively light yield of fleece was due to the conditions of drought experienced throughout the earlier period of development.

Reporting on the consignment, Messrs. Maiden Bros. wrote:—

On account of the strike of slaughtermen at Glebe Island there were no carcase butchers operating in the market yesterday, and consequently we had to group your lambs together in lots to suit exporters. Had we sold them in the small lots as given by you the exporters would not have operated on them, and we deemed it best in your interests to dispose of them in the way mentioned. At the time of writing there is no sign of a settlement, and the position is looking very serious. However, we are hoping that something will be done before Monday, as our market will be considerably affected otherwise.

The 1911 Shipment.

While both first and second crosses were forwarded from Wagga Experiment Farm in 1911, Cowra's contribution to the consignment included only "first crosses." This is explained from the fact that the experiments at Wagga were entered upon a year earlier than at either of the other two places. From Bathurst Farm a number of various crosses, comprising chiefly second crosses, and those specially selected, were forwarded. Excepting those coming from Bathurst, the carcases exported comprised all the lambs reared at the farms during 1911. Dropped between May and June, and slaughtered early in November, the lambs were about 5 months old when the weights were recorded. The carcases were treated in the country. As in case of a

previous shipment, the work of killing, dressing, and freezing was entrusted to the Country Freezing Company, treatment being undertaken at their works at Young. Shipped from Sydney on the 21st November, 1911, and consigned to the Agent-General, they were offered in London early in February, 1912.

The letter of advice sent to the Agent-General on 24th November, 1911, pointed out that the shipment of the previous year was only from one farm (Wagga), and that owing to dry weather those lambs were hardly up to the standards of preceding years. The 1911 shipment, however, included lambs from Wagga, Cowra, and Bathurst, which had been raised under more favourable conditions, especially in the case of Wagga. The 1910 consignment comprised a number of second crosses, but the 1911 lot included both first and second crosses. The Long-wool first cross is not a carcase recommended by the Department for export, and considerable differences in weight, shape, and quality characterised these when compared with the short, compact, more uniform quality of the carcase obtained by mating the Down with this cross-bred ewe. The consignment was forwarded for the purpose of demonstrating these points.

The following is the text of the report furnished to the Agent-General by Messrs. Hudson, Polley, & Co., Ltd., the London salesmen :—

In reference to 238 carcases frozen lamb which you handed to us for sale, *ex* your Experiment Farms at Wagga, Cowra, and Bathurst, we had these lambs pitched on several different days on Smithfield market, and inspected them very carefully, with the result that in our opinion, the lambs best suitable for London trade were the various crosses from your Bathurst Experiment Farm, which realised prices from 2s. 10d. to 3s. 2d. These lambs were well covered and short in leg, and the class of meat which more readily finds sale amongst the butchers here.

The next lambs which we considered most suitable for this trade were the Dorset Horn-Lincoln-Merinos, marked W.H., from Wagga Farm. These lambs, although they were not quite as good as the Bathurst, were excellent lambs, and would always command good prices on this market.

As regards the light lambs from Wagga, they were very poor and unfinished. We should not recommend lambs like these being sent forward unless they could be sold here as third quality

As regards the Cowra lambs, practically the same remarks apply. These light lambs were not of a quality which commands any attention on this market.

The prices realised for the various goods were as follows :—First crosses from Wagga Experiment Farm averaged from 2s. 8d. to 2s. 10d. ; second crosses from Wagga Experiment Farm averaged from 2s. 10d. to 3s. 2d. As regards Cowra, these did not average more than 2s. 6d. to 2s. 10d. Bathurst lambs average about 2s. 10d. to 3s. 2d.

In connection with these prices, however, we might state that on account of the grade number on the bags having been scored out with a very thick blue ink of very indifferent quality, the ink came through the bags on the carcases, and when the lambs were thawed out, ran all over the lambs, making them most unsightly and less saleable. These lambs would probably have realised 3d. to 4d. per stone more than what they did, had they not been so damaged by inkstain.

We shall forward you full particulars as to prices in the course of a few days, and we enclose you copy of Mr. George Hatton's report on these carcases.

The report of Mr. G. Hatton, an independent expert who examined the carcases in London, was as follows :—

The following is a report upon the shipment of lambs, per s.s. "Narrung," from the Wagga, Cowra, and Bathurst Experiment Farms.

From Wagga Experiment Farm, the first crosses, which comprised lambs under 30 lb., were not satisfactory, and the majority of them were plain and unfinished

The second crosses from the same Farm, marked W.F., W.H., and W.I.,* comprised some very good lots, and are very suitable for the London market.

From the Cowra Experiment Farm, which comprised lambs under 30 lb., these were also of an inferior quality, and not suitable for the best class of trade.

From Bathurst Experiment Farm, lambs—various crosses—were a very good lot, and found favour with the London buyers.

We hope that the shippers will take great care to see that ink used for marking lambs from New South Wales freezing works will be of a permanent nature. As you know from remarks on sales-accounts, over 75 per cent. of these lambs were damaged through inkstain.

The one regrettable feature of the whole consignment was the damage done to the carcases by ink stains. The broker's report calls special attention to this condition. As a result the Freezing Company was asked for a report, and the appended letter, which was received from the managing director of the Company, contains the explanation:—

We are duly in receipt of yours of 29th ult., with reference to damage by inkstain to consignment of lambs shipped to London per "Narrung" in November last.

We have made full inquiry into this matter, and are quite at a loss to explain the cause of the trouble. The bags were as always used by us, and the printing was done by the manufacturers as usual; the only marking done by us was a sub-mark and figure denoting the farm from which the lamb was sent and the particular cross of lamb; this was stencilled on with specially prepared ink suitable for the purpose. We have sub-marked thousands of bags with the same ink, and have not had any complaint before. In any case, the quantity of ink necessary for such a small mark could not run to such an extent as to disfigure the carcase to the extent reported. It would appear, rather, that the ink used by the manufacturer in the branding of the bags was at fault, though a test in this direction with bags at present in hand was quite satisfactory.

It is most regrettable that the carcases were disfigured, but from the inquiry we have made, and by experience, we feel confident that everything was properly carried out on our part.

As the broker's report states, 75 per cent. of the carcases were damaged by inkstains. A number, about 20 per cent., were more seriously affected by the ink running than others. The balance, 56 per cent., were, therefore, sold separately. Apart from the disappointment of having the carcases seen in a damaged condition, and thus causing the consignment to lose much of its practical value, the very fact of their unsightly appearance alone detracted greatly from the market value. On the 134 which arrived in a damaged condition, it represented a loss of 1s. 2¾d. per carcase. Table III, worked out for the three farms concerned, gives the gross value of all carcases exported, and shows the difference in value on those which were inkstained.

The Expenses incurred in Shipping.

The shipment was also made the medium for the collecting of information on other important matters concerning the export of lambs. In addition to recording the loss of weight incurred in bringing the lambs from the three farms mentioned to Young, the railway freight on the number despatched from each of the farms was also ascertained, and these charges have been worked out on a basis of total cost per head. The cost on so small a number is considerable. From Bomen to Young, on the 166 lambs forwarded, it amounted to 9d. per head. A consignment of 221 lambs,

* The W.F. were South Down-Lincoln-Merino; W.H. were Dorset Horn-Lincoln-Merino; and W.I. Dorset Horn-Border Leicester-Merino.

TABLE III.—Showing London Weights of Carcases, Classification of Carcases for Sale, and Gross Proceeds of Carcases only.

Wagga Experiment Farm.

Breeds of Lambs.	Symbols.	No.	Total Weight.	Values per Stone (8 lb.)	Average Gross Values of Carcases.	Total Gross Values of Carcases.
			st. lb.	s. d.	s. d.	£ s. d.
Lincoln-Merino	L_1M ..	3	10 6	2 10	10 1¾	1 10 5
*Do	,, ...	14	49 3	2 6	8 9¾	6 3 5
English Leicester-Merino	L_2M ...	3	11 5	2 8	10 4	1 11 0
Do do	,, ...	4	13 0	2 8	8 8	1 14 8
Do do	,, ...	6	18 4	2 6	7 8½	2 6 3
*Do do	,, ...	7	25 1	2 4	8 4½	2 18 7
Border Leicester-Merino	L_3M ...	4	14 1	3 0	10 7	2 2 4
*Do do	,, ...	9	31 2	2 9	9 6½	4 5 11
Do do	,, ...	4	12 5	2 10	8 11¼	1 15 9
*South Down-Merino	D_1M ...	7	24 5	2 6	8 9½	3 1 7
*Dorset Horn-Merino	D_5M ...	7	23 0	2 6	8 2½	2 17 6
Second Crosses—						
South Down-Lincoln-Merino	D_1-L_1M	12	48 1	3 2	12 8½	7 12 5
Do do	,, ...	5	21 0	3 0	12 7¼	3 3 0
Do do	,, ...	1	4 1	2 10	11 6	0 11 6
*Do do	,, ...	10	40 2	2 10	11 4¾	5 14 0
Shropshire-Lincoln-Merino	D_2-L_1M	5	19 4	3 0	11 8½	2 18 6
*Do do	,, ..	9	34 2	2 8	10 1¾	4 11 4
Dorset Horn-Lincoln-Merino ...	D_5-L_1M	1	4 7	3 0	14 7	0 14 7
Do do	,, ...	9	43 4	3 2	15 3¾	6 17 9
*Do do	,, ...	11	54 1	2 10	13 11½	7 13 4
Dorset Horn-Border Leicester-Merino	D_5-L_3M	8	38 7	3 1	14 11¾	5 19 10
*Do do ..	,, ...	14	66 3	2 9	13 0¼	9 2 6
Bor. Leicester-Bor. Leicester-Merino ..	L_3-L_3M	3	12 2	3 0	12 3	1 16 9
Do do ...	,, ...	1	3 1	2 6	7 10	0 7 10
*Do do ...	,, ...	9	36 6	2 9	11 2¾	5 1 1

Cowra Experiment Farm.

			st. lb.	s. d.	s. d.	£ s. d.
Lincoln-Merino	L_1M	3	10 0	2 8	9 6¾	1 8 8
*Do	,,	7	24 1	2 4	8 0½	2 16 3
*Do	,,	7	26 4	2 6	9 1¼	3 3 9
English Leicester-Merino	L_2M	6	20 1	2 8	8 11¼	2 13 8
*Do	,,	9	29 5	2 4	7 8	3 9 1
Border Leicester-Merino	L_3M	8	26 6	2 6	8 4¼	3 6 10

Bathurst Experiment Farm.

			st. lb.	s. d.	s. d.	£ s. d.
Mixed 2nd Crosses	.....	10	40 3	3 2	12 9½	6 7 10
*Do	.....	9	36 1	2 11	11 8½	5 5 4
Mixed 2nd Crosses	.....	8	30 5	3 2	12 1½	4 17 0
*Do	.....	5	19 0	2 10	10 9½	2 13 10

* Ink-stained.

despatched over the same route the year previous, cost only 7d. per head. From Cowra, for the 42 lambs sent, the cost was 6d. per head. The Bathurst lot appears at rather a disadvantage, the charges for freight in bringing the number forward from that farm to Young amounting to 2s. 0¾d. per head. Obviously the cost of freight would in each case have been materially lessened had a greater number been carried, as it costs very little more to forward a full truck than one only partly filled. The sheep van in general use in this State will hold comfortably 110 "woolly" and 120 shorn lambs of about the age of 5 months. The consignment of 221 lambs forwarded from Bomen to Young in 1910 cost on an average 7d. per head.

The cost of killing, dressing, and freezing of the carcase amounted to 2s. 6d. per head. The usual charge is 2s. per head, but an additional charge of 6d. per head was made because of the extra work involved in weighing and separating all the different lots. This figure covered all costs for landing the lambs f.o.b. Sydney. The fat, heads and tongues, as well as the shanks, were retained by the Freezing Company. The weight of fat yielded by all crosses averaged 1¾ lb. each. The proceeds, therefore, as here recorded, were derived from the sale of the carcases and skins only.

The Choice of Market.

From this arises the more serious question to the farmer—the best means for disposing of his stock. In this connection the smaller breeder appears somewhat at a disadvantage. Having only a small number to offer he does not possess the same facilities for the marketing of his lambs as the man who is, perhaps, possessed of a larger number. Three courses are open. He may (1) offer his stock on the metropolitan or local market; (2) have the carcases frozen and sold on the London market; or (3) sell on the property. The farmer should make a study of each of these alternatives and, once having obtained a grasp of the conditions, be prepared to decide which one it should be. Local conditions play a very important part in all such transactions, and only the man on the spot can decide the best course to pursue. Whichever market is chosen, either the local or the foreign, the endeavour to meet it with the class of carcase most in demand will amply repay any extra trouble which may be taken. The condition of the lamb should also be taken fully into account when considering the choice of market. This the report makes quite clear, for it implies that the London market does not favour Australian lamb unless in prime condition and bred on right lines.

Distance from railway, and the time occupied in despatching the sheep from the farm should also be deciding factors. Lambs taken freshly off their mothers waste considerably during long train journeys. The opportunity was taken of recording the loss of weight incurred in bringing the lambs from the three farms mentioned to Young in connection with the present consignment. Table IV supplies the particulars of the lot from Wagga.

WAGGA EXPERIMENT FARM.

TABLE IV.—Showing Loss of Weight in Transit.

Breeds of Lambs.	Number.	Live Weight at Farm.	Live Weight at Young.
First crosses—		lb.	lb.
Lincoln-Merino	17	72½	64
English Leicester-Merino	20	66	58
Border Leicester-Merino	17	72	65
South Down-Merino	7	61	55
Dorset Horn-Merino	7	71	63
Second crosses—			
South Down-Lincoln-Merino	28	74⅓	66
Shropshire-Lincoln-Merino	14	74	67
Dorset Horn-Lincoln-Merino	21	80	74
Dorset Horn-Border Leicester-Merino	22	84	79
Border Leicester-Border Leicester-Merino	13	80	74
Total	166		

If within easy access of a freezing depôt, and there be a sufficient number to make up a fairly representative consignment, the proposition of freezing, exporting, and offering on owner's account on the oversea markets might be considered. Table V, recording particulars of the shipment now under review, affords full information in this connection.

TABLE V.—Account Sales of 166 Lambs from Wagga Experiment Farm.

Expenses on 166 lambs.	£	s.	d.	Expenses per lamb. s.	d.
Rail, Wagga to Young	6	3	8	0	9
Expenses, killing, freezing, Young, f.o.b. Sydney	20	15	0	2	6
Shipping, Sydney to London	14	19	9	1	9½
Commission 2½ per cent., storage and cartage, London	7	16	6	0	11¼
Commission 4 per cent., sale of skins, Sydney	0	14	6	0	1
Total expenses	£50	9	5	6	0¾

Gross Proceeds.	£	s.	d.
Sale of carcases	92	12	10
Sale of skins	18	2	7
Total gross proceeds	£110	15	5

	s.	d.
Average gross per lamb	13	4
Average net proceeds	7	3¼

Account Sales of 42 Lambs from Cowra Experiment Farm.

Expenses on 42 lambs.	£	s.	d.	Expenses per lamb. s.	d.
Railway freight, Cowra to Young	1	1	0	0	6
Expenses, killing, freezing, at Young	5	5	0	2	6
Shipping, Sydney to London	3	15	10	1	9½
Commission 2½ per cent., storage and cartage, London (40 lambs)	1	9	11	0	9
Sale of skins, Sydney, commission 4 per cent. ...	0	4	1	0	1
Total expenses	£11	15	10	5	7½

Gross Proceeds.	£	s.	d.
Sale of 40 carcases	16	18	3
Sale of 42 skins	5	3	4
Total gross proceeds	£22	1	7

	s.	d.
Average gross proceeds	10	11
Average net proceeds	5	3½

Account sales of 30 lambs from Bathurst Experiment Farm.

Expenses on 30 lambs	£	s.	d.	Expenses per lamb. s.	d.
Railway freight, Farm to Young	3	2	0	2	0¼
Expenses, killing and freezing at Young	3	15	0	2	6
Shipping freight, Sydney to London	2	14	2	1	9½
Commission 2½ per cent., storage and cartage, London (32)	1	11	1	0	11½
Sale of skins, Sydney commission 4 per cent. ...	0	2	9	0	1
Total	£11	5	0	7	4¾

Gross Proceeds.	£	s.	d.
Sale of 32 carcases	19	4	0
Sale of 30 skins	3	7	9
Total gross proceeds	£22	11	9

	s.	d.
Average gross proceeds	14	3
Average net proceeds	6	10¼

The third proposition, namely, the disposal of the stock on the farm, seems the most feasible proposal for the smaller lamb seller to entertain. In sending to the central market he has, in addition to defraying the ordinary cost for freight and selling charges, to stand the loss of weight on transit, besides running the risk of having his lambs knocked about, which is a

common occurrence in the case of small consignments during long train journeys. In exporting he is placed at the disadvantage of having only a small line, while the shipping charges, warehousing, dockerage, and cost of treatment before shipping will scarcely justify the outlay in small consignments. After deducting all expenses the farmer with, say a couple of hundred lambs to offer, will invariably find that he can do better by realising on the property. As a rule, large exporting firms, who send their buyers regularly every year to the country, are prepared to pay full market rates for the locally grown lamb. Moreover, large shippers of frozen produce possess more facilities for handling the lambs economically than does the ordinary consignor with only a small parcel. Besides the trade connection and his special knowledge of the business, he is afforded special opportunities of dealing with the by-products to best advantage. Apart from these considerations, small lines seldom evoke that universal and spirited competition that characterises the sale of larger and well classed consignments.

The Question of Grading.

Another feature of the export market that stands somewhat in the way of the small lamb-breeder who wishes to exploit the foreign market on his own account is involved in the present well established system of grading, now recognised by all the leading exporting firms.

As a factor calculated to raise and maintain the standard of our lamb mutton product, the importance of grading cannot be over-estimated. Practically, every exporting firm of note has now its own particular standard of grades. Generally Australian lambs are recognised abroad as "Firsts," "Seconds," and "Thirds." With due regard for shape and quality, lambs scaling from 33 lb. to 38 lb., that is an average weight of 35 lb., are recognised as "First" grades; from 28 lb. to 33 lb., averaging 30 lb., constitute "Second" grades; from 26 lb. to 28 lb. are known as "Third" grades. Sometimes first grades are classed into heavy and light. From 38 lb. to about 44 lb. are classed as "Heavy Firsts," quality and shape being, of course, duly regarded. Under the variable conditions of Australia these standards vary somewhat—a disadvantage under which Australia labours in the matter of uniformity. With the object of preserving a high standard of quality for the Australian exported article, the standards fixed by exporters are further subjected to expert examination and approval. In accordance with the administration of the Commerce Act, which aims at protecting the Australian export trade, duly qualified inspectors have been appointed to visit all killing establishments and to certify to the meat submitted to them.

Whilst grading under these circumstances is an immense advantage to the trading exporter, it is quite impracticable as far as the small lamb-raiser is concerned. Having only a small line it is obvious that he cannot afford to have his small lot divided into as many classes as the variation in the size, weight, and condition of the lambs would necessitate. He should aim to have the lambs as uniform as possible, but he cannot very well avoid having a few that are not uniform with the majority. Where there is a difference of

about two months in age between the first and last lambs of the drop, there must be some that exhibit certain variations, as compared with others. These variations may be obviated, to some degree, by endeavouring to induce the rams to move more vigorously amongst the ewes during the mating period. With the object of bringing the lamb well forward in condition, due regard may also be paid to the maintenance of a regular food supply. In accordance with the conditions just outlined, the number of lambs necessary to make up a representative consignment might be stated, in a general way, as about 200 lambs offered in one line. Due allowance would have to be made, of course, for the classification.

In the case of the present shipment the carcases were not graded, the line being a small one and the object being to test, on a comparative export basis, the values of the different crosses. In this experiment the rams remained with the ewes for about eight weeks. The limits within which the various carcases ranged will be found in Table VI.

TABLE VI.—Showing the range of Dressed Weights of the different crosses.

Wagga Experiment Farm.

Cross.	No.	Lowest Weight.	Highest Weight.	Average.
L_1-M	17	26½ lb.	36½ lb.	31½ lb.
L_2-M	20	23 ,,	33⅛ ,,	28½ ,,
L_3-M	17	26½ ,,	37½ ,,	31½ ,,
D_1-M	7	24½ ,,	33½ ,,	27¾ ,,
D_5-M	7	28 ,,	38 ,,	31½ ,,
D_1-L_1M	28	31 ,,	44½ ,,	35½ ,,
D_2-L_1M	14	27 ,,	42 ,,	34 ,,
D_5-L_1M	21	25 ,,	45 ,,	38 ,,
D_5-L_3M	22	33½ ,,	47⅓ ,,	41½ ,,
L_3-L_3M	13	32½ ,,	47 ,,	38¾ ,,

Cowra Experiment Farm.

L_1-M	20	19½ lb.	35 lb.	29¾ lb.
L_2-M	19	18 ,,	35 ,,	29 ,,
L_3-M	11	18½ ,,	33½ ,,	26½ ,,

Eight of the lightest Cowra lambs were not shipped.

The farmer exporting lambs on his own account, if not prepared to offer them in small lines, must encourage a spirit of co-operation with his neighbours. Two or three breeders situated in one district, breeding one class of lamb and adopting similar methods as regards cropping and feeding, by clubbing together could very easily make up large consignments. No other plan would so materially and promptly overcome the difficulty of marketing small lots.

The advantage to the grower is at once apparent, and the spirit of enterprise which produced the arrangement would be worthy of emulation.

The Value of the Skin.

In consequence of the important part that the skin plays in determining the value of any breed or cross, these were kept separate and their values ascertained. They were carefully weighed in their green and dry states. They were sun-dried, and while thus exposed all shank and rough trimmings were removed, and retained by the Freezing Company. The parcels were then forwarded to Sydney, classified in the respective orders for quality, length of wool, and condition, and disposed of by public auction. Their values have been contrasted, and these, together with the particulars of differences between the green and dry weights, are set out in Table VII.

TABLE VII.—Showing Weight of Lambs' Skins and Values.

	Breeds of Lambs.	No.	Average Weight of Green Skins.	Average Weight of Dry Skins.	Price per lb. of Dry Skins.	Total Gross Values.	Average Gross Values.	Average Net Values.
			lb. oz.	lb. oz.	pence	£ s. d.	s. d.	s. d.
Wagga.	Lincoln-Merino	17	9 4	4 2	6½	1 17 11	2 2¾	2 1¾
	English Leicester-Merino	18	8 12	4 2	6½	2 0 1	2 2¾	2 1¾
	,, (black)	2		4 8	3½	0 2 8	1 4	1 3
	Border Leicester-Merino	17	8 0	4 0	6½	1 16 10	2 2	2 1
	South Down-Merino	7	5 8	3 2	5¾	0 10 7	1 6	1 5
	Dorset Horn-Merino	5	8 12	4 3	6½	0 11 5	2 3¼	2 2¼
	,, (short)	2		3 8	5¾	0 3 4	1 8	1 7
	South Down-Lincoln-Merino	12	7 4	4 0	6½	1 6 0	2 2	2 1
	,, (short)	16		3 11	5¾	1 8 3	1 9	1 8
	Shropshire-Lincoln-Merino	10	7 12	4 11	6½	1 5 5	2 6½	2 5½
	,, (short)	4		2 12	5¾	0 5 3	1 3¾	1 2¾
	Dorset Horn-Lincoln-Merino	21	8 4	4 6	6½	2 9 10	2 4½	2 3½
	Dorset Horn-Border Leicester-Merino	22	8 8	4 9	6½	2 14 2	2 5½	2 4½
	Border Leicester-Br. Leic.-Merino ...	13	8 8	4 6	6½	1 10 10	2 4½	2 3½
Cowra.	Lincoln-Merino	17	9 8	6 1	5¾	2 9 3	2 10¾	2 9¾
	English Leicester-Merino	18	9 0	4 13	5¾	2 1 7	2 3¾	2 2¾
	Border Leicester-Merino	7	8 0	3 12	5¾	0 12 6	1 9½	1 8½
Bathurst.	Mixed 2nd Crosses	18	8 0	4 5	6½	2 2 3	2 4¼	2 3¼
	Mixed 2nd Crosses	12	7 8	3 15	6½	1 5 6	2 1½	2 0½

This information is further supplemented by the inclusion of particulars recording "gross" and "net" values. As the results furnished by the table indicate, it costs, on the average (worked out on the number in the whole consignment), 1d. per lb. to market skins weighing approximately 4 lb. A further comparison of the green and dried weights will show that the shrinkage amounted to about one-half, varying in proportion to the size of the pelt.

Allowing that the total weight of the skin is represented by two-thirds wool and one-third pelt, the advisability of shearing or offering in full fleece lambs intended for export may be deduced. The value of the pelt is about

half that of the wool. The ruling rate for lamb pelts (bare) varies from 3½d. to 4d. per lb. By deducting the weight of the pelt from the total weight of the skin, which comprises both wool and pelt, and adding the difference to the value of the wool, there is ascertained for purposes of calculation the value of the wool minus the pelt. If the wool and pelt combined are taken (as in the Cowra case) as worth 5¾d. per lb. on all crosses, the full value of wool would be approximately 7d. per lb. Thus by taking the average weight of wool yielded by the crosses from that farm, which amounts to 3 lb. 7 oz., and is worth 7d. per lb., the proportionate wool value would on this basis be 1s. 11½d. per lamb. The following will show how this simple calculation is made:—

Proportionate weight of skin included in Table VI, 5 lb. 2 oz., at 5¾d. per lb. = 2s. 5½d.

Two-thirds wool, 3 lb. 7 oz., at 7d. = 1s. 11½d.

One-third pelt, 1 lb. 11 oz., at 3½d. = 6d.

Total, 2s. 5½d.

A similar calculation of the various crosses in the Wagga lot shows the value of the wool to have been 8¼d. per lb., and average approximate value of the skin 6⅓d. per lb. The lower values realised for the first crosses from Cowra as compared with Wagga, were due to the fact that the Cowra skins were very burry. A comparison of the wool weights of a number of lambs of similar crosses shorn at the Cowra Farm at the same time shows that the proportion of wool to pelt was the same.

The expense incurred in the shearing of lambs amounts to about 6d. per head. By deducting this amount from the wool value, there remains a balance to the grower of about 1s. 6d. per head for wool. It should here, however, be mentioned that this return is based on the wool value of "first crosses." Where "second crosses" are concerned the return would probably be lower. From these figures it may safely be deduced that it is not profitable to shear lambs intended for early sale. The comparatively small return which they yield for wool would scarcely repay the outlay. In the case of lambs which are to be carried forward for breeding purposes, or to be kept for sale as grown sheep, to have the lambs shorn is undoubtedly an advantage, for, relieved of their fleece, they develop quicker.

Lambs raised for export should be handled as little as possible, and the knocking about which they receive in the yards, if shorn, together with the shearing itself, is sufficient to so lower their condition as to render many of them unfit for first grades.

Apart from these factors, there is to be taken into consideration the wool aspect of the question. When shorn, the wool left on the pelt is rendered practically valueless except to those manufacturers manipulating very short wools. Usually this wool is classed as "noils," a term used to distinguish the very short waste from the longer staple. The waste thrown off by the

machines during the process of combing is generally called "noil." The wool left on the pelt after shearing ranks as the equivalent of a "second cut," which, as every farmer knows, is of low value. Separated from the staple of which it originally formed a part, not only is the "noil" on the lamb's pelt of low value in itself, but the value of the fleece for combing purposes has been reduced. Sold with the fleece the true value of the "noil" would not only be realised, but the weight of the fleece would be materially increased, because during the process of fellmongering the whole length of the staple would be obtained.

The most valuable skins were those yielded by the LM first crosses. Especially was this noted in those from Cowra, where the L_1M stood out prominently from the rest. A number of second crosses, chiefly D_5–L_1M, D_5–L_3M, and L_3–L_1M, from Wagga, also showed to advantage. This is attributed to the fact that, although the D_5 progeny's yield of wool is conspicuously deficient in texture, it retains the original purity of colour of fleece, which is one of the chief points of the breed. Moreover, the very early maturing qualities help considerably to the early development of the fleece.

As a perusal of the tables will show, very little difference distinguishes the value of the skins of one cross from another at this stage of development. Beyond the slight want of uniformity in the skins yielded by the D_1–L_1M, and D_2–L_1M crosses, in which cases they were classed as "short," the skins sold at a very uniform rate of value.

It appears that the value of the skin is only of very minor importance compared with the value of the carcase, and as the export lamb trade develops the former will sink into insignificance compared with the latter. The lamb has not had time at five months to develop the pelt in the same proportion as the flesh.

The Values of the Crosses.

The particulars of the sales of the carcases clearly demonstrate the unsuitability of the first crosses for export requirements. These are described as long, narrow, unfinished, and too light in weight as compared with the second crosses. The majority of the first crosses were classed as third grades. The D_5–L_1M and D_5–L_3M combinations gave the best returns, both for gross and net values. The D_1 and D_2 crosses realised equal amounts per lb., but the consistently heavier weights of the D_5 crosses enabled them to give the best total returns. The main feature of the whole shipment was the unsuitability of first crosses for export, unless the grower is prepared to market them as third quality, and the value of the second cross is further emphasised. There is very little difference between these, but the earlier maturing qualities of the Dorset Horn places it at a great advantage.

The last table shows the net proceeds from the different crosses forwarded from the three farms.

TABLE VIII.—Showing Net Proceeds.

Wagga Experiment Farm.

Breeds of Lambs.	No.	Average Gross Carcase Value.	Average Gross Skin Value.	Total Gross Value.	Total Net Value.
		s. d.	s. d.	s. d.	s d.
First crosses—					
Lincoln-Merino	17	9 0·59	2 2·75	11 3·34	5 2½
English Leicester-Merino	20	8 6·3	2 1·65	10 8	4 7¼
Border Leicester-Merino	17	9 7·76	2 2	11 9·76	5 9
South Down-Merino	7	8 9·57	1 6	10 3·57	4 2¾
Dorset Horn-Merino	7	8 2·57	2 1·28	10 3·85	4 3
Second crosses—					
South Down-Lincoln-Merino	28	12 2·1	1 11·25	14 1·35	8 0½
Shropshire-Lincoln-Merino	14	10 8·42	2 2·28	12 10·7	6 10
Dorset Horn-Lincoln-Merino	21	14 6·66	2 4·47	16 11·13	10 10½
Dorset Horn-Border Leicester-Merino	22	13 8·9	2 5·5	16 2·4	10 1½
Bor. Leicester-Bor. Leicester-Merino..	13	11 2·46	2 4·46	13 7	7 6¼
Cowra Experiment Farm.					
Lincoln-Merino	17	8 8·94	2 10·75	11 6¾	5 11¼
English Leicester-Merino	15	8 2·2	2 3·75	10 6	4 10½
Border Leicester-Merino	8	8 4·25	1 9·5	10 1¾	4 6¼
Bathurst Experiment Farm.					
Mixed 2nd Crosses	10	12 9·42	2 4·16	15 1½	7 8¾
Do	9	11 8·44		14 0½	6 7¾
Do	8	12 1·5	2 1·5	14 3	6 10¼
Do	5	10 9·2		12 10¾	5 6¼

TRIAL OF BARLEY SEED FROM THE UNITED STATES.

A PARCEL of seed of a barley, identified as S.P.I., No. 23,861, which was received from the Bureau of Plant Industry, U.S. Department of Agriculture, in August, 1911, was tried at Wagga and Cowra Experiment Farms, during last season.

Mr. M. H. Reynolds, manager of Cowra Experiment Farm, reports that it "is a six-rowed variety resembling Cape barley, but ripening about a week later. It is not superior to other varieties."

Mr. R. W. McDiarmid, Experimentalist at Wagga Experiment Farm, reports that "the barley is of the six-rowed type. It is fairly prolific, but appears to be too late for here."

Harvest Reports, 1912.

YANCO EXPERIMENT FARM.

F. G. CHOMLEY, Manager.

No specific demonstration area is cultivated at this Farm. A certain area of Zealand was grown for farm use, but the area was small, viz., 6 acres.

The land was irrigated before ploughing. It was then very hard, and the disc harrow would not make any impression. It irrigated very badly, *i.e.*, the water would not soak in well, as the surface could not be broken, for we then had no suitable implements. Irrigation was continued from 9th to 15th April. Ploughed as soon as watered, it was then in beautiful condition. The part ploughed in the forenoon was harrowed before dinner, and the afternoon's work was harrowed before knocking off. A three-furrow "short-board gang plow" was used. A portion, which was irrigated first, was given a second watering on the ploughed land, as it was drier than the other portions. The ploughing was done at right angles to the drilling, *i.e.*, across the fall.

The seed was sown on 9th May at the rate of 50 lb. per acre, with 60 lb. superphosphate, with a disc drill—an unsuitable implement for the purpose. A portion of the crop was irrigated a second time during the last week in September and first week in October, but, owing to the water level going down in the canal, the work was intermittent and too late for best results.

A small portion of wheat was watered a third time on 24th October. This was near flowering stage. Rain in small showers fell on the 27th, which assisted to lodge some of the crop which was standing then on very soft ground. Wind-storms followed continuously for over a fortnight, which tangled this portion of the crop very badly. We cut with the binder on the 13th and 14th November, having been delayed by 80 points on 3rd November. Immediately after cutting 103 points fell, followed by 47 points; and, before the crop was dry enough to stack, rain fell on the following dates:—1st December, 9 points; 2nd, 35 points; 3rd, 2 points; 4th, 25 points; 5th, 10 points. These frequent showers bleached the outside sheaves of the stooks very much.

The yield, computed by counting sheaves and averaging the weight of same, was 3 tons 13 cwt. 2 qrs. 20 lb. The stubble, on account of the amount lost through lodging, would account for 3 cwt. per acre.

No advantage is to be derived from late irrigating wheat which is in good forward condition. It causes loss through lodging, and delays harvesting if rain happens to follow. Rain is, of course, more deleterious after

irrigation when the soil is too moist to absorb it quickly than in ordinary farm practice, and it is a danger to be carefully thought of before venturing to apply water late in the season on what would be a good crop if left alone.

Some 54 acres were sown with wheat for hay under arrangement with the Murrumbidgee Irrigation Trust. The best hay on this area was cut from land which was disc-ploughed and then irrigated. The land absorbed the water well, and the surface was quickly worked down with a light roller and double disc harrow, followed by the seed drill. The crop was even, straight, and easily cut, made good square-butted sheaves, which in turn made good weather-proof stooks and a quick-handling hay. The balance of the land was irrigated first and then ploughed with three-furrow mould-board, &c., as for the crops grown on the farm. All this crop land, *i.e.*, the mould-board ploughed, was watered again in the spring somewhat late, but as early as labour and water were together available, viz., the middle of October. The disc-ploughed portion, part of which was seeded with seed supplied by the Department (the other seed having been supplied by the Trust), was not watered again after sowing, and the superiority of this procedure, when the season is suitable, is very marked. The crop averaged 2 tons 6 cwt. per acre right through. The seed was locally obtained, and was very poor quality and very mixed. The area sown with graded Departmental seed was very much better.

COWRA EXPERIMENT FARM.

M. H. REYNOLDS, Manager.

THE season just concluded was somewhat unusual, chiefly as to rainfall. For the period 1st January, 1912, to 9th June, 1912, only 146 points of rain fell, and no fall exceeded 28 points. The effect of this shortage of rain was that any seed sown between February and the 9th June lay dormant in the ground. After disc-ploughing 4 to 5 inches deep any stubble paddock, cultivation was persisted in throughout this period chiefly with the spring-tooth cultivator, the object being to keep a loose, coarse mulch and, at the same time, stir the land from time to time 3 to 4 inches deep. On areas cropped the previous year, some of which had to be cropped again, it was expected that self-sown grain from the previous harvest would germinate and grow. Care was taken to guard against this, so as not to have mixtures in the resulting crop. From the 9th June to the 23rd October the rainfall was satisfactory. A shortage occurred later until the 25th December. Bare fields were the rule until early in June, followed by strong and rapid growth, resulting in a good harvest, the grain and hay harvested being of good quality, a little pinched grain occurring only in the late maturing varieties. Seventeen varieties of wheat were sown, two varieties of oats, and one of barley for grain; portions of wheat and oats were cut for hay. The rate of seeding was:—Wheat, 49 to 57 lb.; oats, 61 lb.; barley, 50 lb. per acre. Superphosphate at the rate of 60 lb. to the acre was applied with the seed

For the 1912 harvest 128 acres were sown to cereals outside the area kept for experiment purposes. Of this area 40 were cut for hay, wheaten and oaten. The 17 acres, chiefly of Federation and John Brown, cut for grain, yielded 442 bushels, averaging 26 bushels to the acre, Of the remainder (approximately 71 acres) 24·3 acres were threshed for oats, 44·64 acres were threshed or stripped for wheat, and 2 acres were threshed for barley.

From the 24·3 acres of oats 834 bushels were obtained, the average per acre being 34·32 bushels.

From the 44·64 acres of wheat 1,165 bushels were obtained, the yield per acre being 26 bushels.

From the 2 acres of Skinless barley 69 bushels were obtained, the yield per acre being 34·5 bushels.

From the 40 acres for hay 103 tons were obtained, the yield per acre being 2·5 tons.

Threshed straw stacked 130 tons..

Trial of a New Variety of Wheat.

Early in 1911 the Minister of Agriculture received from the Agent-General in London a bushel of Mr. C. W. Marster's new French wheat "Perfection," which had been obtained by the Agent-General for the purpose of a trial under local conditions. The package was forwarded to the manager of Cowra Experiment Farm, and trials were arranged for at several farms in 1911.

At the end of the first season Mr. Pridham, Plant Breeder, reported that it had been rejected at Nyngan and Hawkesbury on account of its lateness in maturing, and it also proved too late for Cowra, Wagga, and Bathurst. Germination was very bad at Cowra, but another trial would be made with it.

Accordingly it was tried in 1912, and Mr. Pridham's report states the grain resembles that of Galland's Hybrid, which is inferior for milling purposes. Even at Glen Innes the wheat is too late in maturing to be profitably grown, and it is quite unsuitable for Cowra.

Hay as Against Grain.

In harvesting hay practically the whole of the straw is removed, and in this way the land loses a large quantity of plant food. In stripping, the straw is left, and can be ploughed in, so that the soil is not impoverished to any extent. It is quite certain that two crops of hay will deplete the land as much as three crops of grain when stripped.—Geo. Valder.

Maintaining Fertility in Illinois Soils.

"The Story of a King and Queen" is the title of a little pamphlet (Circular No. 145) issued by the Illinois Agricultural Experiment Station, with the object of impressing upon Illinois children the proper methods of maintaining permanent fertility in the soil. The "King" is maize, who travelled west to the "Land of the Illini" and took possession of his kingdom. In course of time the food ready-prepared for him in the soil became partially exhausted. He thereupon sought a princess named "Clover," who became his queen. Where she prepared the soil he was as well fed as ever.

Years passed—happy and prosperous years—but again King Corn began to complain that his bed was getting hard and his food insufficient, and Queen Clover replied that she too was hungry, and her home becoming sour. They therefore called in the old family physician, "Doctor Science." The doctor recommended ½ ton per acre of bone meal or rock phosphate (to supply phosphorus) and 2 tons per acre of ground limestone, to be applied once every four or five years. Then he recommended rotation of crops—corn, oats, clover; corn, wheat, clover—or four-year rotations, such as wheat, corn, oats, clover (in grain farming), and corn, corn, oats, clover (in live-stock farming). Only grain should be sold, as clover, straw, and stalks should be returned to the land, to supply organic matter and nitrogen; and all manure should be saved. The doctor's recommendation put everything right.

The story is founded upon some experiments at the station. Land, growing maize continuously for thirty-one years, only produced an average of 23 bushels per acre for the last six years. Land which had been in pasture for many years gave an average yield of 63 bushels per acre for three years when sown with maize. Upon this land a three-years' rotation was then commenced—corn, oats, clover; and the area was divided into three fields—A, having no treatment; B, receiving limestone only; C, receiving limestone and phosphorus. With each treatment the rotation was maintained. At the end of three years A had averaged 67 bushels, B 69 bushels, C 74 bushels; at the end of the next six years A averaged 63, B 67, C 87 bushels. This was in grain farming. In live-stock farming, with limestone and phosphorus, 90 bushels per acre were received. Not only the maize, but the oats and clover seed also gave greatly increased yields.

The Station wishes to impress the lesson upon Illinois, and prints the story for that purpose.

Sowing Rhodes Grass.

As a rule the best results with Rhodes grass are obtained where the ground is ploughed, but working the land with a disc or other harrow, scattering the seed and then lightly harrowing again often gives satisfactory results.—Geo. Valder.

The Production of Seed Wheat.

During the recent conference of Departmental officers, at which the list of varieties of wheat and other cereals recommended for different districts and purposes was approved, as published in last issue of the *Agricultural Gazette*, discussion took place on the increasing demand for the Department's seed wheat.

It was stated by Mr. Valder, Superintendent of Agriculture, that it is becoming increasingly difficult to satisfy the demand of growers for seed wheat, and he suggested that farmers in the true wheat belt should be urged to grow their own seed from smaller quantities, purchased each year from the Experiment Farms. In the meantime it was not in the interests of the industry as a whole to actually limit the quantity to be sold to individuals, but the time was coming when a maximum of a bag or two would have to be fixed, and it was desirable to postpone that contingency in order to give farmers time to adapt themselves to the production of their own seed wheat.

During the discussion it was pointed out that what the Department is now selling is something more than "seed wheat"—it is really "stud wheat," and as such should be used for the production of seed under ordinary farm conditions, rather than for directly sowing large areas.

The memoranda of the Superintendent and the Plant Breeder indicate the value of using the Department's seed, and suggest how farmers may make the best use of the small quantities to which they are asked, as far as possible, to confine their future purchases.

CHANGE OF SEED.

GEO. VALDER, Superintendent.

It is generally advocated that farmers should obtain a change of seed from time to time, and experiments in many districts have shown this to be absolutely necessary. For a farmer to purchase large quantities of seed every two or three years means considerable expense, and of late it has been proved that the practice is actually unwise. It has been found that if, instead of obtaining large quantities, farmers purchased a small quantity of the best seed obtainable, and from this grew their own seed for the following year, they would as a rule get far better results in every way at a reduced expenditure.

This was brought under my notice very forcibly in connection with the farmers' experiment plots, where it was found that when high-class seed wheat was brought from the Experiment Farms and sown in the plots with check plots

of the farmers' own seed, the Departmental wheat gave far better results than the farmers' own seed; but if the farmers saved the wheat obtained from the plots in which the Government seed was used, and sowed it in the following year alongside of plots sown with seed obtained direct from the Government farms, the former gave the better result. I noticed this first in connection with some plots at Parkes some years ago. A farmer on whose land we had had experiment plots one season, kept the wheat off a plot of Rymer (the seed for which had been supplied from one of the farms), and sowed it the next year, together with more Rymer seed which he had obtained direct from the Government Farm. The crop from the seed which had had the advantage of one season to acclimatise it was better than the other. I have noticed the same occur frequently since, proving how necessary it is that farmers should grow their own seed.

The advice of the Department is that farmers should not purchase large quantities of seed from the Government farms, but should purchase only sufficient to produce their own seed for the following year. This small quantity should be sown on land which is of the best quality available, and which has been fallowed and otherwise well prepared, so that the crop may be given every chance of success. This means that farmers should regard wheat obtained from the Department as "stud wheat," and not as "seed wheat."

At the present time the Department is quite unable to supply anything like the quantity of seed applied for—in fact, this year fully ten times as much seed could have been sold as was available. If farmers would content themselves with buying from the Government farms for stud purposes only, there is no doubt that we could supply practically all the wheat that would be required for producing the crop of two years hence.

There is a very large demand for seed of Firbank—a variety used on an extensive scale as an early hay wheat—the reason being that farmers do not regard it as a good grain wheat except for the far western districts, and in the majority of cases they cut it for early hay, omitting to keep any for seed, and relying on the Government farms for next year's supply. As a result, the demand for this variety was exceptionally great this year, every bushel produced being applied for a hundred times over.

In the case of wheats required for coastal purposes, such as Thew, Warren, and Huguenot, the position is different, as the farmer on the coast cannot save his own seed, the conditions usually being against the maturing of the grain, and the proper means of threshing it not being available on the farm. Such seed wheat will, therefore, have to be grown in the inland districts, and it seems to me that it would be profitable for western growers to take up the production of seed for sale to coastal farmers. The Department, recognising the circumstances in this case, has made arrangements to grow larger areas of these varieties; but the demand is so great that we shall never be able to supply the quantities required, especially as we have to grow so many varieties for other districts.

GROWING SEED WHEAT ON A SYSTEM.

J. T. PRIDHAM, Plant Breeder.

A good deal has been written on the subject of selection, but one feels that the work the Department is doing in this line is not availed of to the extent that it might be.

By selection we do not mean the removal of pinched and small seeds from a sample, though the grading of seed is very desirable. Selection is, properly, the raising of seed much on the same principle as obtains in the stud breeding of cattle. Improved strains are isolated, kept pure and propagated in larger quantities for sale. Such improved seed is more valuable before it reaches the farmer's hands than afterwards, inasmuch as the tendency is always to deteriorate and to fluctuate about a mean or average. It would be to the advantage, therefore, of the farmer to secure a small parcel of this seed from one of the Department's farms, rather than use his own or a neighbour's which has deteriorated after being grown for some years without selection. The fact that in the farmers' experiment plots conducted by the Department in various districts, the farmers' seed has usually been beaten in yield by one or more of the Departmental varieties, is an evidence of the value of the methods of selection we employ.

When threshing the small samples of wheat which represent the harvest from the breeding plots, the writer was struck by the marked difference noticeable between grain of Federation, which has been grown continuously at Cowra under selection, and the average farmer's sample of this variety. The effect has been to keep up the yielding qualities of the wheat, but the most remarkable result is the quality of the grain, which is decidedly superior to the average from a bread-making point of view ; being bright and horny looking. On showing the grain from our small selection plots to a well known local buyer, he expressed the greatest surprise at the appearance of the grain, which, as he said, resembled that of Comeback. He could not believe that it was Federation. The seed sold to farmers is from larger areas, and would not present quite such a marked contrast. The Department is anxious to introduce improved seed wheat to the grower, but there is no reason why these should be bought in large quantities. Six shillings per bushel is a high price to pay for seed wheat, though the cost of production at the Government farms quite justifies the charge.

We do not recommend the farmer to go in for the cross-breeding or the individual plant selection practised on our breeding plots, but we would strongly advise him to buy a bushel each year from us of any wheat he usually puts in. This might be sown fairly thinly on about 2 acres of clean, fallowed land. The produce of this would sow enough land next year to provide seed wheat for the whole farm the third year, and leave a balance for sale. There would thus be three classes of wheat sown which, for branding purposes and general convenience, might be known as "Plot" seed, "Block" seed, and "Paddock" seed.

1st year—Seed wheat from the Department = Plot seed.

2nd year—Seed produced from plot = Block seed.

3rd year—Bulk seed to sow the farm, the produce of block = Paddock seed.

After the third year the three classes of seed should be regularly sown every year to keep up a continuous supply. The slight trouble of keeping the lots of seed separate would be well repaid by the improvement in the produce.

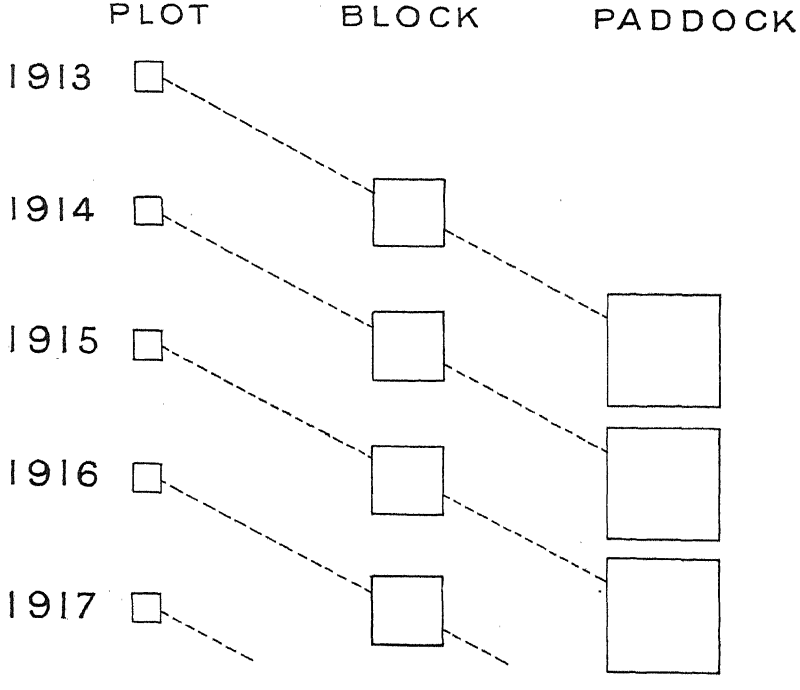
Another advantage of growing one's own seed in this way is that it can be kept free from smut. When clean machinery is used, and is not lent to neighbours, it would not be necessary to pickle any seed except (to be on the safe side) the bushel received from the Department. Although opinions differ as to the advantages to be gained from the exchange of seed and buying from a distance, our work at Cowra shows that home grown seed usually matures plumper grain, and grows more vigorously than introduced seed.

Apart from the increased cost of buying a large quantity of seed wheat at 6s. per bushel, such seed will probably not give such good results on the purchasers' farm as seed raised in the way described.

In conclusion, it may be said in favour of this suggestion that—

(1) The cost of seed wheat would be less.
(2) Smut would be avoided.
(3) Yields would be more even and consistent from year to year.
(4) Yields would be greater, and the quality of the grain improved.

The accompanying sketch illustrates the method by which the seed could be raised on the farm.



The plots and blocks could be sown side by side in the same paddock, leaving a narrow track or division between each, and using the ordinary farm seed-drill.

Our Natural Pastures.

The Black-Soil Plains.

E. BREAKWELL, B.A., B.Sc., Economic Botanist.

It is a well-known fact that the black-soil plains are, at their best, ideal pasture lands, and are considered by good authorities to be the best grazing lands in New South Wales; but it was very evident to the traveller going through the "black" country that these ideal pastures were, at the time of a recent visit, sadly lacking. With the exception of dead thistles, thorny *Sclerolæna*, and very scattered small clumps of dried grass, the country presented in almost every direction a really miserable and parched appearance.

The cause of this lies not so much in dry climatic conditions, as in other directions. It is quite true that the thunderstorms and monsoonal rains of summer have, in a most tantalising fashion, evaded the North-west. But the late winter and early spring rains were abundant enough to give the grasses a good start, and it can be demonstrated that, with proper management, good grazing country could exist, even after five months' absence of rain.

Encouraging Good Native Grasses.

For this purpose, attention must be first drawn to a fine grass selection in Moree district, viz., Nyngle Station, between Gurley and Tycannah. This selection, which is stocked to the extent of one sheep to 1½ acres, may be taken as typically representative of the class of soil, and of the climatic and physical conditions of the North-west; nevertheless, it presents the appearance of an oasis amidst a wilderness of almost barren waste.

The selection affords a striking example of the possibilities of the native grasses of New South Wales. The average height of the grass is 2 feet, and the average weight per square yard of surface 1½ to 2 lb. The grasses comprise about thirty different varieties, and they all appear to thrive well. They have been recorded—and Mr. C. B. Keene, the owner of the station, has practically demonstrated the truth of the record—as most nutritious and valuable grasses. Fifty per cent. of the grasses on the typically heavy black soil of the estate is comprised of the Mitchell grasses, *Astrebla elymoides* and *Astrebla triticoides*. This in itself is a remarkable fact. An experienced grazier once remarked to the writer: "You have to go to Queensland to see Mitchell grass; there you will see it up to your knees." But the very fact that you can see it above your knees at Nyngle Station shows that Queensland need not lead the way for New South Wales, even with Mitchell grass.

The virtues of this grass have not been exaggerated. Even after five months' absence of rain it presented a remarkably fresh appearance, and was particularly characterised by the large amount of new foliage which sprang from every joint right up the stem.

Growing in close association with Mitchell grass were *Andropogon sericeus* (Queensland Blue grass), *Pollinia fulva* (Sugar grass), *Danthonia semiannularis* (Wallaby, or White Top grass), *Anthistiria avenacea* (Tall Oat grass) *Anthistiria ciliata* (Kangaroo grass), *Aristida leptopoda* (Three-awned Spear grass), *Panicum prolutum* (Coolah grass), and *Panicum trachyrachis* (Coolabah grass).



The Effects of Overstocking and of Judicious Stocking Compared.
The overstocking of the paddock on the left has resulted in thistles, and the judicious stocking of the paddock on the right in a luxuriant growth of native grasses.

Andropogon sericeus, or Queensland Blue grass, under favourable conditions, thrives luxuriantly in the black soil, and is a great favourite with stock of all kinds. It does not, however, provide as large an amount of foliage, or possess as good drought-resisting qualities as Mitchell, Sugar grass and Three-awned Spear grass (*Aristida leptopoda*). The three last-named grasses grow in clumps 2 feet in diameter, thus protecting to a large extent the inner parts of the bundles, it being a common occurrence to find, on brushing the withered outsides apart, that the grass within is fairly fresh and green. Queensland Blue grass, however, grows in fairly small clumps, has very little protection from the prevailing hot winds, and rapidly dies off after two or three months' absence of rain.

Pollinia fulva (Sugar, or Brown-top grass) may be considered to be one of the hardiest grasses, and at the same time a fine fodder. According to the Queensland *Agricultural Journal,* this grass was the principal standby in many parts of that State during the drought in the early part of 1912, and its appearance in Moree district after five dry months certainly bears out this statement. *Danthonia semiannularis* (Wallaby, or White-top) does not, in the North-west, attain anything like the luxuriant growth it does in the Riverina. It is a very important grass, however, in the fact that it maintains its growth and verdure right throughout the year.



A Judiciously Stocked Station (Nyngle).
Appearance after four months' absence of rain.

Panicum prolutum (Coolah grass) grows in clumps 18 inches in diameter, stands a large amount of dry weather, and is well liked by stock. According to the writer's own experience, combined with the testimony of reliable graziers, this grass will spread fairly rapidly over a run, if nursed a little.

Anthistiria avenacea (Tall Oat grass) and *Anthistiria ciliata* (Kangaroo grass) are a little coarser in the flag than the grasses previously mentioned, and are more valuable for cattle than for sheep. They certainly require discriminate stocking, for if stocked heavily they are the first grasses to disappear, while if stocked judiciously they are prevented from becoming too rank, and provide fattening and palatable herbage.

While the spread of Spear, Wire, or Corkscrew grasses on a selection cannot be advocated, there is no doubt that the inclusion of a grass like *Aristida leptopoda* is beneficial to a native pasture. It possesses three particular virtues, viz., it may be considered one of the hardiest of the native grasses of the black soil, it responds very quickly to rain, and it is one of the first grasses to make an appearance after the winter season. With careful stocking there does not appear to be any fear of it taking possession of a pasture.

Mention must be made of a fine Panic grass which grows luxuriantly in the black soil, viz., *Panicum trachyrachis* (Coolabah grass). The clumps are even larger than those of *Panicum prolutum*, and it is a remarkably fine drought-resister. While essentially a cattle grass, it is also very much appreciated by sheep, and, like the other Panic grasses, it is deserving of every encouragement.

Growing on the more sandy portions of the selection, one finds such grasses as *Chloris acicularis* (Lesser Star grass), *Chloris ventricosa* (Blue Star grass), *Chloris truncata* (Windmill or Star grass), and *Panicum gracilis* (Slender Panic grass). These are all good sheep grasses, and well adapted to dry conditions. Other fine fodder grasses on the selection, but not in such abundance as those hitherto mentioned, are *Andropogon intermedius*, *Sporobolus Lindleyi* and *Sporobolus actinocladus*, *Panicum decompositum*, and *Eriochloa annulata*. Exception could not be taken to one grass on the estate.

Why should this selection stand out so prominently above others? The secret lies in skilful and careful management—the nursing of the good grasses and the avoidance of overstocking. Such management proves, as far as this district is concerned, at any rate, that—

(*a*) we may have no fear of Mitchell or other good native grasses disappearing;

(*b*) that many varieties of native grasses will grow together and hold their own (a most desirable condition);

(*c*) that Kangaroo grass will stand a fair amount of stocking;

(*d*) that the more judicious the stocking the larger the "clump" habit of the grasses, and the more drought-resisting they become;

(*e*) that no introduced grasses like Barley grass, &c., are required to produce good grazing country.

Overstocking.

Much has been written, and more spoken, about overstocking. All admit its evil consequences, and many try to make amends. Moreover, there appears to be in many places a vague idea of what is really meant by overstocking. Many graziers think that if the stock remain for any length of time in good condition, the land is not being overstocked. Such an idea is misleading, because, by running all the stock a selection will carry for a certain length of time, a grazier is actually overstocking, and the result will surely be decrease in the carrying capacity in future years.

The problem can be best understood by considering the land as having a maximum carrying capacity, and a judicious or *optimum* carrying capacity. By "maximum carrying capacity" is meant the largest number of stock a

selection will carry without taking into account the condition of the selection itself for future production, whereas by "optimum carrying capacity" is meant the largest number of stock a selection will carry without injury to the pastures, at the same time providing for future grasses and the eventual best results to station-owner and State.

When is Land Overstocked?

It is evident that no hard-and-fast rule can be laid down as to the exact number of stock a station will carry. Observation of the conditions of the pastures themselves must guide the owner. If the grasses are not allowed to seed at least once in the year, or if any spot or spots are allowed to be completely depastured, and the grasses to be replaced by thistles or other weedy herbage, the land is certainly being overstocked. Few seasons are needed to see the consequences. The good grasses become less and less in number, and as they become replaced by the weeds the stock leave the latter and eat the few good grasses that are left. The natural consequence is the substitution of weeds and noxious grasses for good pasture plants. Once such deterioration commences its increases, not in the same constant proportion, but in a proportion multiplied year by year. Miles of country in the North-west are now covered with thistles and other similar herbage.

Again, the spread of Barley grass, Barren fescue (*Festuca bromoides*), Soft Bromes (*Bromus molles*), and other useless agricultural grasses in New South Wales has been remarkable. Less than twenty years ago they were rarities in many places. Now, they have taken almost complete possession of the pastures. But, as the law of the survival of the fittest indicates that present conditions in many localities are more favourable for these than for the native grasses, it follows that, unless the latter are nursed and encouraged, the useless introduced grasses and weeds will predominate where at one time the natural herbage thrived.

Overstocking Considered Financially.

It is natural that a grazier should produce the largest amount of wealth he can from his land by stocking to the fullest capacity; but such financial results cannot be maintained by doing so. Unfortunately, little data are available to determine how quickly a selection deteriorates by overstocking. With regularly distributed annual rainfalls it would take much longer than under adverse conditions. But we can be justified in assuming that an overstocked selection which carries one sheep to the acre, will, in 15 years, carry only one sheep to 3 acres. If, then, on a station, say, of 3,000 acres, the maximum stocking is one sheep to the acre and the optimum stocking one sheep to an acre and a half, in 15 years 45,000 sheep will have been carried by maximum stocking, and 30,000 by optimum stocking. But by this time the carrying capacity of the overstocked land will only be 1,000 sheep for the 3,000 acres, while that of the optimum-stocked land will be 2,000 sheep. Extending the period over another 30 years, 30,000 sheep will have been carried on the maximum-stocked land and 60,000 on the

optimum-stocked land. It will thus be found that over the period of 45 years £7,500 more (valuating the sheep at 10s. a head) will have been produced on the optimum-stocked land than on the maximum-stocked land. In this hypothetical case it is assumed that the land suddenly deteriorates from one sheep per acre to one sheep per 3 acres, whereas deterioration commences right from the beginning, and the profit from optimum stocking would thus be greater still. Again, the area considered is a comparatively small one. If a million acres were overstocked, it would mean a loss to the State of 2½ million sterling in a period of 45 years, or nearly £56,000 annually. The period (45 years) certainly appears to be a long one, and would not appeal to



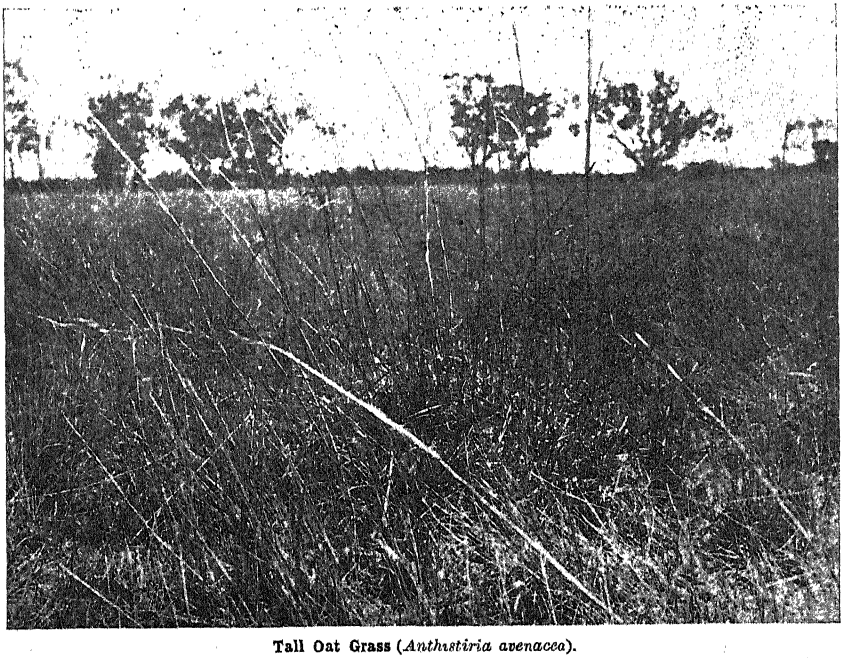
Mitchell Grass (*Astrebla elymoides*), Moree District.
A good drought resister, providing nutritious feed in summer and autumn.

the temporary lessee whose business it is to get all he can out of his land and then seek fresh pastures; but it is an argument that should appeal to the permanent owner and to the State, both of whom are concerned in the condition of the pastures for future generations. Something must certainly be done unless we wish to be confronted with the same difficulties that America was faced with, viz., depletion in pastures and expense of renovation.

How Deterioration of Pastures may be Checked.

Most graziers are, through their practical experience, thoroughly aware of the good grasses on their estates. Many owners are also quick to observe if a good grass is gradually diminishing in quantity, and its place being taken

by a less desirable fodder plant. One, however, often hears the remark, "this country will not fatten like it used to." Such a statement means that the good grasses are being replaced by less desirable herbage—not because of adverse climatic conditions, or of loss of nutriment in the soil, but because the good grasses have not been encouraged. Now, practical and observant as the "man on the land" may be, it should be apparent that the Department can give information about grasses which is not accessible to graziers—information which has resulted perhaps from chemical analysis, perhaps from the combined observations of botanists and of reliable authorities on the land. Considering that the Department is always willing to give such



Tall Oat Grass (*Anthistiria avenacea*).
A good cattle grass.

information, it is evidently to the interests of the grazier to forward a grass about which he is desirous of ascertaining certain facts, and in most cases the facts should be forthcoming.

Assuming, then, that the grazier is cognisant of the grasses best adapted for his estate, it is to his interest to obtain a pasture of these grasses. Of course, the surest method would be cultivation and laying down to the best; but it must be admitted that cultivation on a big selection would be impracticable and too expensive.

A good deal can be done by scattering good native grass seed over the area, just after rain if possible, and tramping it in with sheep or other stock. The black-soil plains are particularly adapted to this primitive method of cultivation, owing to the fact that the cracked nature of the soil allows the

seed to be buried with very little difficulty. The owner of Nyngle Station is of the opinion that native grass seed may remain dormant in the soil for a long period, but when sufficient rains arrive it is washed to the surface and then germinates. Many graziers employ this method of scattering native grass seed on their areas, and often with very beneficial results.

Grasses Worth Propagating.

Many pounds have been spent in the attempt to introduce artificial grasses on the black soil, but, so far as the writer is aware, entirely without success. This does not mean that there is no chance in the future of an introduced grass being suitable for this area, but it is evident that perfect pastures can be obtained with native grasses, and it is these we must seek to perpetuate. The native grasses mentioned in the beginning of this article are well adapted for the black soil, and may be assured of success. Although the germination of native grass seed is not high (perhaps an average of 25 to 30 per cent.), still by sowing a fairly large quantity a good stand should be secured.

In America good results have been obtained by ploughing furrows here and there over the selection. The wind-blown seed is then deposited on the cultivated ridges and germination is assured. Many of the wind-swept areas in the interior of New South Wales might be reclaimed by harrowing or scratching the surface, and laying down to native grass seed.

Division and Resting of Pastures.

It is clear, however, that the main success in checking deterioration will be ensured by dividing pastures and resting them from time to time.

Much of the black-soil area has, through overstocking, become herbage country. This is very unsatisfactory, for while it may provide excellent feed in the winter months, it is only temporary in character. During the summer, autumn, and well into the winter, the stock have to subsist on dried herbage, seeds, and dirt, and perhaps on a very small amount of dried grass that has previously escaped being eaten out. It is possible to obtain a judicious mixture of grass and herbage that will provide feed right throughout the year.

To restore the grasses to herbage country it is absolutely essential that resting and very light stocking be done. If a grazier is sceptical about the result of such treatment, let him carry out a small experiment. A small portion of his estate may be fenced off and rested for a couple of years. More certain success is assured by scattering native grass seed. The writer has seen very beneficial results from this method of treatment, and if the process is continued at periodical intervals a good stand of grass is secured over a very large area, and the carrying capacity increased enormously.

Most graziers divide their areas into paddocks, but in many cases they are far too large. The larger the paddocks the greater the trampling, and the more the best are picked out, eaten down, and not allowed to seed. In an area of 12,000 acres, say, eight paddocks would not be too many. Once a good stand of grass is obtained in paddocks of limited area, judicious handling of such paddocks will produce a maintenance of the pastures for an indefinite period.

The Relation of Fertilisers to Soil Fertility.*

A Short Survey of Present Views on the Subject.

F. B. Guthrie, Chemist.

In looking through previous volumes of the Association I find that the addresses of my predecessors in the office to which you have done me the honour to elect me, have dealt, without exception, with the broader aspects of the connection of the State, or of this Association, with agricultural progress or agricultural education.

It seemed, therefore, more fitting that I should take as the subject-matter of my address the development of some specific branch of agricultural science, especially as nearly everything I could say on the subject of agricultural policy has been well said by my predecessors. An occasion like the present appears a fitting one in which to pass in review the most recent advances made in our science, as the presence of so many workers from the different States renders it possible to discuss new developments from various points of view.

A great deal of what I shall have to say—probably all of it—will not be new to those of you who are engaged in scientific work in agriculture, and have followed recent work at all closely; but there are, no doubt, many who have not the time nor opportunity to keep themselves posted in the literature of the subject, to whom I trust a presentment of the matter may prove of some interest.

To all alike a review of what has been done in any given line of work should stimulate discussion and be an incentive to further investigation.

I purpose to review shortly the main lines along which recent work has been conducted regarding the relation of fertilisers to soil fertility

The trend of recent research in agricultural science has brought forcibly home to us the fact that the function of fertilisers is not restricted to the duty of supplying plant-food to the growing crop. Under certain circumstances, indeed, this function is in abeyance—in the absence of sufficient water, for example, or in the presence of unfavourable soil-conditions, the action of fertilisers is almost negligible—and it is our lack of understanding of these conditions that has been the frequent cause of want of success in the use of manures.

The idea that failure in plant-production is due solely, or even chiefly, to deficient plant-food in the soil is no longer tenable.

Recent investigations have brought to light a host of other causes of unfertility, but the idea still persists at the back of many soil analyses, that the

*Presidential address delivered before the Agricultural Section of the Australasian Association for the Advancement of Science, Melbourne, 1913

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We know further that certain fertilisers benefit certain crops. We know, for example, that the application of superphosphate will probably increase the yield of wheat and other cereals; but this knowledge is not derived from information supplied by the composition either of the soil or the wheat plant.

The wheat crop, grain and straw, contains only half the quantity of phosphoric acid that it does of nitrogen, and much less than it does of potash, and yet we know that neither nitrogenous nor potash manures are anything like as effective as soluble phosphates in increasing the yield. Nor does soil-analysis help us to any extent. The soil may be comparatively rich in phosphates and poor in nitrogen and potash, and still phosphatic manuring is the more effective. Our wheat soils in the semi-dry country are indeed lacking for the most part in humus and nitrogen, and yet it is by the application of superphosphates and not of nitrogenous manures that crops are successfully grown.

The case of leguminous plants is of a similar nature; crops like peas and beans and clover contain more nitrogen than other fertilising ingredients, and yet manuring with nitrogen is resultless, and the ingredients which are most beneficial are potash and phosphates. Here again, it is immaterial whether the soil is rich or poor in nitrogen or rich in potash. The composition of fruit-trees does not explain why potash manuring should be of such special benefit, nor is there any satisfactory explanation why the mangel crop —which contains nearly four times as much potash as the potato crop—should not benefit by the application of this ingredient, whereas it is an essential, a "dominant" ingredient for manures applied to potatoes.

I do not wish to press this point further, but simply to accentuate my statement that the composition either of the crop or of the soil is not an infallible guide to the nature of the manuring required. In fact, we have not advanced much on the principles enunciated by Ville. We still manure with a complete manure, paying special attention to the ingredient which is "dominant" for the particular crop.

Explanations of these peculiarities will no doubt be forthcoming. In the case of leguminous crops, we are acquainted with the process by which they obtain the required nitrogen from the air and are independent of soil nitrates or nitrogenous manuring.

In the case of wheat, I have suggested an explanation, which I venture to think is the correct one, of the rather extraordinary phenomenon that the application of nitrate or other nitrogenous manure which is essential to the production of wheat in Europe and America is without effect on crops grown locally, its place being taken by superphosphate.*

Shortly stated, this explanation lies in the different conditions as to nitrification prevailing here and in Europe and America during the growth of the crop. In the latter countries the wheat commences to grow in soil from which the nitrates have been washed out, and in which nitrification does not take

* *Agricultural Gazette*, New South Wales, vol. 17 p. 29.

place until the crop is approaching maturity. With us nitrification is active and progressive during the early growth of the wheat plant, and nitrogenous manuring is unnecessary, all that is required being the application of a fertiliser which promotes the development of the root-system, a quality which appears to be possessed in a high degree by superphosphate, thus ensuring the young plants a vigorous start.

It has been further shown by J. W. Paterson and P. R. Scott* that superphosphate appreciably increases the nitrification of ammonia, indicating that, in some cases, the addition of phosphates may help to nourish the nitrifying organisms as well as the crop.

We will now review shortly some of the recent work which has shown that the growth of plants is affected by causes other than lack of plant-food, or unfavourable mechanical soil conditions, and which encourages us to look to other remedies for unfertile conditions.

We shall see, incidentally, that fertilisers may have an action upon the growth of the plant which is altogether independent of its power of supplying plant-food, and which until recent years has been quite overlooked.

Toxic Substances in Soils.

That substances are formed in the soil, either as the result of the decomposition (chemically, or by means of micro-organisms) of crop-residues, or excreted by the growing plant, seems to be abundantly proved.†

O. Schreiner was the first to show the toxic effect of dihydroxystearic acid and to isolate this substance from soils on which wheat failed to grow.‡

Further experiments by the United States Bureau of Soils§ have shown that quite a large number of organic substances exercise a toxic action on plant growth.

F. Fletcher‖ describes experiments showing the extraordinary influence of the neighbourhood of sorghum and of maize upon the growth of "sesamum indicum." This is not due to the removal of moisture or of plant-food by the maize crop, as both these essentials were abundantly supplied to the sesamum, but must, he concludes, be attributed to the excretion of a toxin by the roots of the maize plants. Fletcher believes this to be a salt of dihydroxystearic acid.

Among the numerous toxic organic compounds which Schreiner and his fellow-workers have found to be present in the soil, three or four have been more partiularly studied in relation to their action upon plants provided with varying quantities of the recognised fertilising ingredients.

Schreiner and Skinner¶ have shown that in water cultures with wheat, dihydroxystearic acid is least harmful when the plant is provided with fertilising substances relatively rich in nitrogen (such as nitrates), and that in

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* *Journal of the Department of Agriculture*, Victoria, vol. 10, p. 393.
† Schreiner and Shorey, Bull. 74, Bureau of Soils, U.S.A.
‡ Bull. 53, Bureau of Soils, U.S.A.
§ Schreiner and Reed, Bull. 47, Bureau of Soils, U.S.A.
‖ *Journ Agric. Science*, IV, p. 245.
¶ Bul . 70, U.S.A. Bureau of Soils.

the presence of this soil toxin the plant removed less phosphoric acid and potash than under normal conditions, but that its absorption of nitrogen was more nearly normal.

The action of other soil toxins was made the subject of further study* and the following very interesting and rather remarkable results were obtained:—Vanillin (an aldehyde) behaves in very much the same way as dihydroxystearic acid in its general effect upon roots and leaves, and its effects are least when the plant is supplied with nitrates. It is pointed out that nitrates increase root-oxidation, whereas both dihydroxystearic acid and vanillin, being capable of further oxidation, are themselves reducing agents.

Quinone is another organic substance whose presence affects the growth of plants. Unlike the two substances mentioned above, quinone is an oxidising agent, and its ill-effects are less marked when the plant is supplied with relatively large proportions of sulphate of potash, which has a known influence in restraining root-oxidation.

A fourth substance is coumarin, a substance of fairly wide distribution in the vegetable kingdom, and found to be toxic to many plants. Schreiner and Skinner† find that it is particularly toxic to wheat, the leaves being short and broad, and the roots discoloured, and their surface very shiny. The harmful effect of this substance was greatest when phosphoric acid was absent from the nutrient solution, and practically disappeared when the fertiliser was rich in phosphates. The same results were obtained with wheat-plants grown in soil in culture-pots.

It would, therefore, appear that the bad effects due to the presence of dihydroxystearic acid and of vanillin can be to a large extent neutralised by the application of sodium nitrate, those due to coumarin by phosphoric acid, and those due to quinone by sulphate of potash. With the exception of coumarin, these experiments were carried out apparently only in water-culture experiments, and the point must not be lost sight of that these results when tried in the field may be considerably modified by the chemical or physical nature of the soil. They are sufficiently striking to emphasise the fact that the function of fertilisers is not solely to supply plant-food.

Fungi Affecting Crops.

Another way in which one crop may affect injuriously a succeeding crop is by the production of a fungus which infects the soil and attacks the young plants. A fungus of this nature has been found by H. L. Bolley‡ to be the cause of what are known as flax-sick soils, that is soils which after continuous cropping with flax (which does not unduly exhaust the soil) are unable to produce flax. He quotes an experiment in which flax was grown for six consecutive years on a fertile soil of the Red River, the result being that the land was "in such a diseased condition that not a plant of flax can exist on it longer than three weeks from the time of sowing." This

* Schreiner and Skinner, Bull. 77, U.S.A. Bureau of Soils.
† *Loc. cit.*
‡ Bull. 50, North Dakota Agric. College, 1901.

condition of things is well known in Europe and America to flax-growers, and it is the custom in Europe at all events to sow flax at intervals of not less than eight years on the same land, the flax being part of a rotation including turnips, oats, clover, wheat, and beans.

Bolley has found that this flax-sickness is due to the growth of a fungus which he calls *Fusarium lini*, which lives in the humus of the soil and attacks the flax-plant.

Manuring of any description was quite ineffective in improving the growth of flax or in destroying the fungus, nor did treatment of the soil with any of the usual fungicides produce any better results. There appears to be no way to rid the soil of the parasite, as the fungus lives in the soil for many years without any flax crop to feed upon. This fungus does not appear to attack any other crop.

The remedies suggested are treatment of the seed with substances such as formalin, and a five years' rotation of flax with wheat, hay, pasture, and maize.

Bolley has also shown* that the deterioration of wheat-lands is brought about by three or four parasitic fungi (in a later communication he gives the number as at least five), whose growth is encouraged by the practice of continuous cropping of the land with wheat, and which are propagated and attack the wheat plant in exactly the same way as flax is attacked by *Fusarium lini*.

Similar instances of loss of crop-producing power have been long familiar, that of clover sickness being one of the earliest to be recognised. Peas, beans, turnips, and cauliflowers are all subject to parasitic fungi which grow on the buried portions of diseased plants and communicate the disease to healthy plants. The same is also true of many of the fungus diseases which affect the potato, tomato, &c.

Infertility often due to Bad Husbandry.

In all these cases we have toxic conditions which are quite distinct from the unfertile condition brought about by soil-exhaustion, conditions which are not dependent upon the richness or poverty of the soil, and which no amount of manuring in the ordinary sense will remedy. Indeed, when we consider the large stores of plant-food in average and even in poor soils, the comparatively small proportion removed by even the most exhausting crop, and the fact that this store of plant-food is being constantly rendered available, it becomes difficult to realise that a few years' cropping can effect such a complete removal of plant-food, as we must assume to take place if the soil is exhausted in the manner usually recognised.

As a matter of fact, analyses of European soils go to show that under continuous cultivation there is little or no difference in the mineral content of the soil. In short, the inferior crop-producing power of a soil after repeated cropping is due to other and more obscure causes than the simple depletion of the soil in plant-food.

* Press Bulletin No. 33, North Dakota Agric. Expt. Station, Oct. 1909.

It is open to doubt whether such a thing exists as an unfertile soil, that is, one which will not give satisfactory results under proper treatment. Plants, we know, can be grown in ignited sand or distilled water, if the proper nourishment is supplied. The barren regions of the earth are all capable of being made reproductive under proper treatment, witness the alkali-lands of Texas, and the salt-lands of Utah. Even the desert yields abundantly in the fortunate places where springs occur, or where the land can be inundated by rivers. On the other hand misapplied energy may convert a fruitful country into an unproductive one, and much of the desert and sterile land has once been fertile, and has been brought to its present condition by unthrifty husbandry.

Travellers in Palestine tell us that its numberless hills are covered with the ruins of what have once been populous cities, a certain sign that the surrounding country has once been, not only fertile, but extensively cultivated to provide food for the town populations.

Sir Frederick Treves, the most recent visitor to record his impressions of this country in his work "The Land which is Desolate," contrasts the promised land "that floweth with milk and honey" with the "poverty stricken, miserly, thread-bare country" of to-day.

The plain on which the ruins of Babylon now stand is still covered with a network of old canals, which served both to irrigate and to drain what was in ancient days extremely fertile country, but which is now divided between desert and marshes. Herodotus testifies to the remarkable fertility of Babylon in his time, when it was a great commercial centre.

Professor Heeren in his work on the "Commerce, &c., of the Principal Nations of Antiquity," tells us how the discovery of a new path to India across the ocean, converted the great commerce of the world from a land-trade to a sea-trade, and thus Nineveh "sunk to its original state of a stinking morass and a barren steppe."

This is that same Nineveh, the capital of a country which its king described as "a land of corn and wine; a land of bread and vineyards; a land of oil-olive, and of honey."

There are many other instances where great and populous centres have flourished at the expense of the surrounding country, which they have finally impoverished and involved in their own ruin, and this is a danger, probably the greatest danger, with which rural Australia is faced to-day.

Plant Secretions not always Toxic.

The secretions of plants are not, however, necessarily always toxic to other plants. The beneficial results of growing leguminous plants with non-legumes is well known, and an experiment carried out by J. G. Lipman shows this particularly well.*

Lipman grew oats in quartz-sand in porous pots which were placed in larger pots also filled with quartz-sand in which field-peas were grown. The

* *Journ. Agric. Science*, vol. 3, p. 297.

sand in both cases was supplied with the necessary mineral fertilising constituents, but with no nitrogen. Both plants grew vigorously, the oats obtaining their supply of nitrogen by the diffusion of soluble nitrogenous material from the outer pot in which the legumes were growing.

If, instead of a porous inner pot, the oats were grown in glazed pots and were thus unaffected by the nitrates formed by the legumes, they produced a much diminished yield, and showed the growth and colour associated with lack of nitrogen.

Another case in which a beneficial action is exerted on the growth of plants by organic soil-constituents, and one in which such action cannot be attributed to any direct fertilising power, is furnished by creatinine and creatine. Creatinine is an organic substance which exists not only in the humus of soil, but in farmyard and organic manures, and in many plants and seeds, and whose presence in the soil has been found to indicate fertility.

The United States Soil-Bureau * have isolated and experimented with this substance, and with creatine, of which latter it is the anhydride. These authors have found it in stable manure and peas used as green manures; also in wheat, seedling wheat grain, bran, rye, some leguminous plants, and potatoes.

Both creatine and creatinine are nitrogenous substances, and experiments in manuring show that they can replace nitrate in its effects on plant-growth, at all events in culture solutions.

Micro-organisms - Toxic and beneficial.

In yet another direction a great deal of interesting work has been done, showing the part played by minute organisms in relation to soil fertility. It had been known for some time that treatment of the soil both by heat and by antiseptics favoured the growth of crops.

S. U. Pickering † found that when soils were either heated or treated with antiseptics the total soluble organic matter of the soil was increased, and at the same time toxic conditions were produced which hindered germination, such inhibitory action being, however, only temporary, as the toxins were subsequently destroyed, presumably by oxidation.

E. J. Russell and H. B. Hutchinson, ‡ in an elaborate and careful series of experiments, appear to have shown conclusively that the beneficial effect of partial sterilisation by heat or antiseptics upon the growth of the crop, is attributable to the larger proportion of ammonia present in the soil after such treatment. These authors explain this phenomenon as follows :— Probably in all soils certain larger unicellular organisms (protozoa) are present, which feed on the bacteria concerned in the formation of soluble nitrogen compounds and keep them in check. If the soil is partially sterilised by heating for a short time to the temperature of boiling water, or by subjecting it to the action of vapours such as chloroform, bisulphide of

* Schreiner, Shorey, Sullivan, and Skinner, Bull. 83, Bureau of Soils, U.S.A.
† *Journ. Agric. Science*, vol. 3, pp. 32 and 258.

carbon, toluene, &c. (such vapour being subsequently removed by spreading the soil out in a thin layer and allowing the vapour to evaporate), the effect is to destroy the protozoa and probably most of the bacteria as well, but not the spores of the ammonia-producing bacteria. These spores subsequently develop, and in the absence of the hostile protozoa, their development proceeds with increased activity, the result being a considerable increase in the soluble nitrogenous plant-food and a more vigorous crop growth.

These experiments have so far been carried out in the laboratory. If means are discovered of partially sterilising the soil in the field, a most valuable method of increasing the fertility of the soil will be placed at the disposal of the farmer.

Indeed, experiments in this direction have been recently carried out by E. J. Russell and J. Golding* on "sewage-sick" soils. They find that "sewage-sickness" is an abnormal development of the factor harmful to bacteria (protozoa) always present in ordinary soils, and that the loss of efficiency in the purification of sewage in such soils is due to the hindrance of the development of the bacteria. Small land-filters were made in the field, some being filled with untreated soil and others with treated or sterilised soil. The effluents were examined periodically. The untreated samples soon became "sewage-sick," whereas the effluents from the treated filters retained their efficiency for months. A further experiment was tried by treating small plots in a similar manner, the plots being then sown with turnips. The crops on the treated plots (especially that treated with toluene) were not only better than those from the untreated, but suffered much less from "finger and toe."

Further interesting trials were recorded by E. J. Russell and F. R. Petherbridge† of the action of heat and antiseptics upon sickness in glass-house soils. In countries where plants like cucumbers and tomatoes are grown under glass, the soil is found to be unsuitable for the growth of these plants after a short time, sometimes after the first crop. The soil used is therefore thrown away, and as it is necessary to enrich it very much with manure and to expend much time and labour on its preparation, this is a very wasteful operation. The authors find that previous steaming of the sick-soil of a commercial glass-house in which cucumbers were grown, resulted in curing the soil of cucumber-sickness and rendering it once more commercially profitable. The same was found to be the case with tomato-sick soil on which a number of different antiseptics were tried. Of all methods, heating the soil to 98° was found to be the most efficient. The cost of this operation is from 1s. to 1s. 6d. per ton of soil, which while profitable in the case of plants grown under glass, is quite prohibitive on large areas.

S. U. Pickering‡ considers that on heating a soil the amount of soluble plant-food is increased, and the changed bacterial conditions studied by

* *Journ. Agric. Science*, vol. 5, p. 27.
† *Ibid.*, p. 86.
‡ *Journ. Agric. Science*, vol. 3, p. 277.

Russell and Hutchinson conduce to more vigorous growth, but that at the same time certain toxic substances are formed which arrest plant-growth, but as these toxins are unstable and readily oxidised the toxic conditions do not prevail for any length of time.

F. Fletcher* obtained very much higher yields with maize plants grown in soil previously heated, which results he attributes to the destruction by heat of an alkaloid dihydroxystearate. He also finds germination injuriously affected by previous heating. This he attributes to increased osmotic activity which results in a decrease of imbibition, brought about by increase of soluble organic substances.

R. Greig-Smith,† to some extent opposes the conclusions of Russell and Hutchinson. The beneficial action of disinfectants, such as chloroform, toluene, &c., is explained by him as being due to the removal, by these reagents (all of which are wax-solvents), of a wax-like substance (agricere) with which the soil particles are coated. With the removal of this water-proofing the soil nutrients are more easily dissolved in the soil-water and attacked by bacteria.

According to this investigator, the principal nitrogen-fixing bacterium in soils is *Rhizobium leguminosarum*, the number of which affords an indication of the comparative fertility of the soil, and which, in the most fertile soils, may be present to the number of three or four millions per gramme of soil. He finds, further, that all soils contain a substance which acts as a bacterio-toxin, fertile soils containing a small, poor ones a large amount. This toxin is destroyed by heat, sunlight, and storage, and is washed into the subsoil by rain, so that after a shower of rain the surface soil is richer in bacteria than the lower strata. This latter is an extremely interesting observation, as indicating that the beneficial effects of rain or of irrigation are not confined to the mere supply of water or even of fertilising salts to the soil.

These bacterio-toxins are insoluble in wax-solvents, and are not volatile.

He finds also that after the protozoa have been destroyed by heat at 65° to 70°, the action of volatile disinfectants is to increase still further the bacterial productiveness of the soil.

Additional indication that these disinfectants act as wax-solvents in dissolving the agricere, is afforded by the fact that the upper layers of soils so treated are less nutritive to bacteria than the lower, which is what might be expected if the disinfectant on evaporation carried the agricere to the surface.

Dr. Greig-Smith is reading a paper before this section, in which he recapitulates his work in this connection.

If the theory that the action of heat and of solvents is to destroy the waterproof coating is correct, one would expect that the soils so treated would yield more of their mineral ingredients to soil-solvents. The evidence

* *Cairo Scient. Journ.*, 1910, 4, reprint (Abstract in *Chem. Soc. Journ. Abstracts*, vol. 100, ii, 350).

on this point is not conclusive, but it is fairly certain that the increases, when such have been found, are insufficient to account for the great increase in fertility noted by Russell and Hutchinson (three or four times the crop in the case of heat, and 20 to 50 per cent. in the case of volatile antiseptics).

S. U. Pickering* shows a slight increase in the total water-soluble material, both of heated and of treated soils, but the nature of the mineral matter extracted is not stated.

G. S. Fraps† has found that previous ignition increases the amount of phosphoric acid, which can be dissolved from several naturally occurring phosphates. Wavellite, in particular, yields ten times as much phosphoric acid, soluble in $\frac{N}{5}$-nitric acid, after as before ignition.

It is to be remembered, however, that in this case there is no question of the presence of agricere, and further, that, in our soils, at all events, these minerals are not likely to be present in any quantity.

C. B. Lipman‡ finds in the case of soils the opposite effect to that noted by Fraps in the case of phosphatic minerals. He finds that the effect of igniting soil is to reduce the amount of phosphoric acid extracted by nitric acid. This agrees with the observations of J. König and others§ that phosphoric acid is fixed by colloids in the soil forming insoluble calcium phosphate, so that the combination is rendered more complete by the action of heat.

H. I. Jensen‖ has also investigated this point. He treated several soils of varying known degrees of fertility with different soil-solvents before and after ignition—*e.g.*, strong hydrochloric acid (sp. gr. 1·1), citric acid (1 per cent.) and nitric acid ($\frac{N}{5}$).

The results are very irregular and vary in different directions, being frequently identical, but they point to the conclusion that in the case of heated soil at all events the increased fertility is not due to the greater solubility of the recognised plant-foods. Any considerable differences occur only in cases where the quantities of plant-food are extremely small and are probably due to experimental errors.

C. B. Lipman¶ has carried out experiments in which previously sterilised soil was infected with filtered suspensions, so as to remove the protozoa. He finds no difference in the results when such filtered liquids are used and when unfiltered suspensions containing protozoa are employed, and is "unable to confirm the claims of Russell and Hutchinson as to the influence of protozoa in modifying the amount of work done by decay bacteria."

Another view of the action of heat upon soils has been more recently advanced by O. Schreiner and E. C. Lathrop** and E. C. Lathrop††. These authors find that heating the soil results in an increase in the water soluble constituents

* *Journ. Agric. Sci.*, vol. 3, p. 32.
† *Journ. Ind. Eng. Chemistry*, vol. 3, p. 335.
‡ *Journ. Ind. Eng. Chem.*, vol. 4, p. 663.
§ *Land. Versuch. Stat.*, 1911, vol. 75, pp. 377–441.
‖ *Proc. Roy. Soc.*, N.S.W., vol. 45, p. 169.
¶ New Jersey Agric. Expt. Station, Bull. 248.
** *Journ. Am. Chem. Soc.*, vol. 34, p. 1242.

and in acidity, although ammonia and amines are formed. Heating the soil produces simultaneously both beneficial and harmful organic compounds. Amongst the beneficial are xanthine and hypoxanthine, guanine, cytosine and arginine, and among the harmful hydroxystearic acid. These substances, if already present in the soil, are increased by heat, and if not originally present are produced by the action of heat. The heated soil possesses at first a decreased fertility, owing to the production or increase of dihydroxystearic acid, but when this ingredient disappears, either through oxidation, cropping, addition of lime or nitrate, the fertility of the soil is increased. This explanation, it will be seen, opposes the conclusions of Russell and Hutchinson as far as the effect of heating is concerned, and attributes this effect to the alteration of the proteid matter of the humus, rather than to the action of micro-organisms.

There are thus several theories in the field to account for the action of heat and of antiseptics upon the soil. On the one hand, it is attributed in both cases to a partial sterilisation of the soil, as a result of which certain organisms are destroyed which are hostile to the ammonia-producing bacteria; on the other hand, the action of antiseptics may, it is suggested, be due to the removal of an impervious wax-like material surrounding the soil grains, the presence of which hinders their being attacked by soil-solvents; and in the case of heating a third suggestion is that at first both harmful and beneficial organic substances are produced, the harmful ones being readily oxidised.

Effects of Fertilisers on Physical Properties of Soil.

Soluble salts in small quantities exert an influence upon the physical properties of soils. Aikman* points out that the quantities of fertilising matter in farmyard manure are insufficient and in an unsuitable form for the growth of crops, and that the chief influence of such manure is on the structure of the soil. R. O. E. Davis† has studied this influence more particularly in the case of the apparent specific volume of the soil, rate of capillary action, and change in vapour pressure.

He finds that most fertilisers accelerate capillary movement, sulphate of potash and a mixture of sulphate of potash and phosphoric acid retard it. Soluble salts, whether acting as plant-food or not, may produce in the soil changes in structure which in turn influence plant growth. Their effect is most pronounced in soils containing a large amount of fine particles.

Influence of Fertilisers on Soil-moisture.

The action of soluble salts in affecting the moisture conditions of the soil is of great importance. Cameron and Gallagher‡ have shown that the physical nature of the soil changes with its moisture-content, and consider that for every soil there is an optimum moisture-content at which its physical condition is most favourable for plant growth.

Of the various problems presented by a study of the physical nature of the soil, the one which is of the greatest importance is the question of the behaviour of water in the soil. This applies with special force to us in Australia, where the problem of conserving the soil-moisture is of even greater importance than that of manuring. The action of fertilisers, especially potash salts, in keeping the surface soil moist, is well known. The application of fertilisers has been found to have a very considerable effect upon the transpiration ratio of plants, and to enable them to make a better use of the available moisture.

In fact J. W. Leather* in the course of an investigation into the water requirements of crops in India, finds that the transpiration ratio (that is the relation between the weight of water transpired by the crop and the weight of the dry crop) is always lower when suitable manures are employed, and concludes that " speaking generally the effect of suitable manure in enabling the plant to economise water is the most important factor which has been noticed in relation to transpiration."

It appears possible, however, from more recent researches of the same author† that the decrease in the transpiration ratio when suitable manures are added, is due rather to the more vigorous growth of the plant than to any specific action of the manure on the transpiration ratio.

Dr. Leather has, at all events, shown this to be the case with superphosphate, which when supplied to a soil known to have no need for phosphatic manuring did not lower the transpiration ratio.

This, however, is a case in which it is possible to confuse cause and effect. The soil in question was unusually rich in available phosphoric acid, containing more than three times as much as the richest of the other soils, and it is not impossible that the transpiration ratio was affected by the presence of soluble phosphoric acid in the soil.

J. W. Paterson‡ has published results of experiments to determine the transpiration ratio of oats, which are of interest in this connection, although the question of the effect of manuring does not enter into the investigation.

He finds the transpiration figure for this crop, grown in pots and partially shaded during the period of their growth, to be about 483, that is to say, 483 tons of water are transpired for every ton of dry crop produced.

He assumes that for plants of moderate development, grown in the open air in Victoria, this figure would be 700, as against 870 in India (Leather, *loc. cit.*); 522 in America (King); and 665 (Wollny) to 376 (Hellerіegel) in Europe.

According to Leather a 13-bushel crop of wheat (about 1 ton grain and straw) will transpire 693 tons of water (or 6·8 inches of rain) per acre in India. Dr. Paterson states that local conditions indicate that about 600 tons of water (6 inches of rain) per acre would pass through a 13-bushel crop of wheat during its growth under Victorian conditions.

This estimate is not, however, supported by experimental figures, and it is to be hoped that Dr. Paterson will be able to continue his investigations so as to include the determination of the transpiration ratio of an average wheat-crop grown in the open under ordinary conditions, since the question is one of the very first importance in wheat-growing in Australia, and in establishing the geographical limits within which wheat-growing can be successfully carried on with us.

The subject of soil physics is much too wide to come within the scope of an address like the present one, but I have been tempted to draw attention to the possible influence of fertilisers on the movement of soil-moisture, because of the very great importance of the study of moisture conditions to us in Australia. In this connection an interesting investigation has been carried out by Dr. Heber Green and G. A. Ampt* in which are given methods of determining the constants, specific pore space (the free space per unit volume of soil), permeability to water and air, and capillary coefficient. It would be of very great interest to determine the extent to which the addition of fertilisers or soluble salts affect these constants.

Influence of Fertilisers on Soil-oxidation.

Another direction in which fertilising substances can function in other ways than as plant-food is in the promotion of oxidation in soils.

M. X. Sullivan and Reid† have shown that the oxidising power of soils is increased by the presence of water up to the optimum, and by the common fertilising substances, also by salts of iron, manganese, lime, and magnesia, especially when simple organic hydroxyacids are present. They find that soil-oxidation is comparable with the same process in plants and animals, and that it is greater in surface than in subsoil, and greater in fertile than in barren soils.

O. Schreiner and H. S. Reed‡ showed that calcium salts, phosphates, and nitrates increase the oxidising power of plant roots, whilst potassium salts tend to retard it.

Catalytes, or Plant Stimulants.§

There are also a large number of compounds whose presence in minute quantities appear to have very often a quite remarkable effect upon plant growth. These substances cannot be regarded as fertilisers in the ordinary sense. Some of them are of rare occurrence in the soil, or occur only in minute quantities; many of them are distinctly injurious in any large quantity. We are quite in the dark as to their precise function, and the name "catalytic" has been given to them for want of a better.

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* *Journ. Agric. Science*, vol. 4, p. 1, and vol. 5, p. 1.

† *Journ. Ind. Eng. Chem.*, 1911, vol. 3, p. 25.

‡ Bulletin 56, Bureau of Soils, U.S.A., Dept. of Agric. *See also* Schreiner, Sullivan, and Reid, Bull. 73, Bureau of Soils, U.S.A., Dept. of Agric.

§ A bibliography has been kindly prepared by Mr. L. A. Musso, of the Department of Agriculture, New South Wales, which may be found useful to those who wish to look up the literature of the subject. An excellent *résumé* of the subject is also published by M. Cercelet, *Revue de Viticulture*, tome 38, No. 981, p. 381.

H. Ost found small quantities of fluorine to be always present in a number of healthy leaves which he examined.

Aso, Oscar Loew, Ampola, and others, show that small quantities of fluorine have a stimulating effect on many plants. Iodine has been shown also to stimulate the growth of plants when in small quantities. Oscar Loew and the Japanese chemists, who have done a great deal of work in experimenting with the foregoing elements, and with lithium, cæsium, and uranium, find that they stimulate the growth of a number of plants both in the field and in pots. Titanium has also been found to increase the yield of crops. C. E. Wait has found titanium in the ash of every plant which he has examined, and Annett states that the colour of the black cotton soil of India is due to the presence of a titaniferous mineral. I have found titanium to be present in soils of the black-soil plains in the north-west of New South Wales, but cannot assert that this is the cause of their colour, since other soils, from the same locality and derived from the same minerals, which are red or chocolate in colour, also contain titanium. The addition of flowers of sulphur has also been found to improve the yield of many crops. Copper is stated by some writers to increase plant growth when present in small quantities, but by others to be injurious. Boron appears to be very widely distributed in the plant world, and the proof of its presence as a natural constituent of grapes and of wines is of considerable economic interest. At the rate of $\frac{1}{2}$ gramme per square metre it has been found by Agulhan to increase enormously the yield of wheat, maize, rape, and turnips.

The literature with regard to manganese, its occurrence in plants, and the action of minute quantities, is voluminous. In minute quantities it appears to be beneficial, in larger quantities toxic, and its toxicity appears to increase with its stage of oxidation.

Other substances that may be mentioned in this connection are vanadium, chromium, nickel, barium, zinc, mercury, didymium, and glucinum.

For the most part these substances are plant poisons, but quite remarkable benefits have been obtained by their application in very small quantities.

It may very well be that some extremely important discovery may be made as the result of the study of these catalytic fertilisers, one that may throw some light on the question of plant assimilation. Among the most striking results obtained to date appears to be the very remarkable effects produced by some of these metallic salts upon moulds—the effect, for example, of zinc upon the development of *Aspergillus niger*, ten times the quantity of this mould being produced in solutions containing 1 in 50,000 of zinc.

The subject of catalytic fertilisers, or the action of small quantities of substances on plant growth, is an extremely fascinating one, but too little is known of the mechanism of the processes involved to make it desirable to pursue the subject further in this place. It affords additional illustration of the fact that the beneficial action of so-called fertilising substances is not

The minute quantities used are quite inadequate to supply plant-food in the generally accepted sense of the term. For example, Aso, in some experiments with peas, found that the growth of the crop was stimulated, and the yield increased by 0·001 gramme sodium fluoride per 2 to 3 kilos of soil.

Another Japanese investigator found 940 grammes of the same salt per hectare to benefit barley and certain grasses.

In the cases also where these substances act as plant-poisons, the proportions are exceedingly minute. Similarly we know that iron-salts are necessary for the production of chlorophyll, and that in the absence of iron in the soil or culture medium the chlorophyll cells do not develop, and yet chlorophyll itself contains no iron.

There is some action of which we are ignorant in all these cases, for an explanation of which we must wait for the plant physiologist.

Recent work by Willstätter, Marchlewski, and others, has established the fact that a great similarity exists between some of the products of the green-colouring matter of plants and the hæmoglobin or red-colouring matter of the blood of animals and human beings. It has been shown that chlorophyll is a magnesium compound, and contains no iron, which latter is an essential constituent of the red-colouring matter of the blood. It would appear as if the peculiar property of chlorophyll to absorb and split up carbonic acid is due to the presence of magnesium in the chlorophyll molecule, whereas its replacement by iron effects the absorption of oxygen. We know of similar instances in which the introduction into an organic molecule of metallic or elementary atoms results in remarkable physiological activity. Ehrlich's celebrated specific against syphilis (a definite amido-benzol compound containing arsenic) is one of the best known instances in point. Wassermann has used a selenium derivative of eosin successfully in the cure of cancer in mice.

A number of similar compounds are at present under trial, particularly in the case of cancer.

The remarkable effects produced by the entrance of such elementary atoms into the molecule is a fact of the highest significance, not only in the study of disease in men and animals, but in plant physiology also.

The above short review of the work which is being done in the solution of a certain class of soil problems shows that the action of fertilisers is not confined to supplying the crop with food, but that it is far more complex, and that fertilisers influence the physical structure of the soil, and also its biological and chemical condition in a great variety of ways; further, that we have to take into account a large number of factors which affect the fertility of the soil and which are quite independent of its supply of plant-food.

We have seen that fertilisers may exert an influence on the toxic matters produced in the soil, the texture and the moisture-condition of the soil, on the development of bacteria or fungi, on the oxidising power of the soil, and that

quite remarkable effects are produced by substances added in quantities much too minute to act as nourishment to the plant.

I do not for a minute desire to underrate the great importance of manuring in maintaining the fertility of the soil. I only wish to emphasise the point that the old conception of manures as acting solely by supplying plant-food must be abandoned.

There are, I venture to think, very few who would nowadays recommend a particular manure formula based, on the one hand, on the composition of the crop, and on the other, on the composition of the soil.

It appears to me that for the next important advance in our knowledge of fertility conditions we must look in the near future to the plant physiologists and the bacteriologists.

The great rôle played by toxic substances, perhaps of bacterial, perhaps of chemical origin, leads us to look for substances which shall restrain their development—for antitoxins.

Just as diseases in men and animals are being combated by the discovery of substances which retard their progress, so it may be hoped that our plant physiologists may be able to discover antitoxins which shall render harmless the poisons which are secreted either by the growing plant or by the metabolism of organic matter in the soil, whether such substances are produced by bacterial agencies or by purely chemical changes. We shall, no doubt, find that many substances which we now apply in the confident anticipation of increased crop production act less by virtue of any special plant-food with which they supply the crop than through their power of retarding or preventing the formation of substances hostile to plant growth.

Soil-analysis will in the future concern itself less with the elaboration of methods for determining the proportions of plant-foods, than in searching for conditions likely to produce toxic substances, and for means to overcome them. Unfertile conditions, whether due to soil-bacteria, fungi, or the formation of poisonous chemical substances, will be combated by the same weapons as are now employed against similar diseases in men and animals.

Whilst there is no intention in all that has gone before to suggest for a moment that we should cease to manure with the recognised fertilisers—potash, nitrogen, and phosphates—or that we should cease to conduct experiments as to the best proportions of these manures for different crops, still I feel that future progress in this matter lies more with actual farmers' experiments, where the principles already established by careful scientific investigations can be tested and modified to suit actual conditions. I feel that the time occupied in elaborate manure experiments on the old lines, and in the elaboration of methods of soil analysis on the old lines, would be better spent in the study of other factors productive of soil fertility or infertility—such as some that I have outlined above—and I hope that it may be possible for some of our Australian workers to devote more time to plant physiology, to the study of soil toxins, and the elucidation of conditions which render the soil fertile or infertile—whether physical, chemical, or micro-biological in their nature.

Farmers' Experiment Plots.

SOUTH COAST WINTER GREEN FODDER EXPERIMENTS, 1912.

R. N. MAKIN, Assistant Inspector.

THE autumn sowing of 1912 was favoured with good rain. As a rule—judging by rainfall records—April is rather a dry month, and having noted this the areas set apart for the work were ploughed some months before sowing, and, in all but three cases, were sown in April. This was considered preferable to sowing in March, as a dry April had, in other instances, greatly affected March sowings. On this occasion the crops made a splendid start, but, unfortunately, exceptionally heavy rain—up to 1,324 points—fell during the month of July, and had a very bad effect on the crops, especially where the drainage was not good.

Rainfall.

The rainfall varied somewhat along the coast during the time the crops were growing; for instance, at Unanderra, from 1st April to the end of October 23 inches of rain fell, including nearly 11 inches in July. At Bega for the same period 13½ inches fell, including 4 inches in July. Comparing the rainfall of this period of 1912 with the same period of the two preceding years, the returns for the Bega district in 1910 were 862 points, and in 1911 913 points, so it will be seen that the 1912 rainfall was some inches in excess of that experienced in other years. As the excess occurred practically during one month, more harm than good was done.

On looking into the results of the experiments it will be seen that Thew and John Brown wheats have again proved to be well adapted to coastal conditions.

Thew Wheat.

This variety has found its way on to many of the dairy farms, and very satisfactory results were obtained in many cases, whilst in others failure was brought about by sowing too early. Owing to the rapid growth of this variety in comparison with other varieties, April sowing is to be preferred, as otherwise it will run into ear too early. The plots at Tilba Tilba were sown on the 27th March, and the Thew wheat was cut as green feed on the 26th July, the period of growth being 122 days. The Albion Park plot was sown on 15th April and the Thew was cut on the 27th August, the period of growth being 134 days. This variety has been well out in ear in 84 days in other seasons, but the wet winter of 1912 somewhat kept it back.

In most cases a shortage of feed is felt on the South Coast during August and September, and crops that will mature about that time are of value. Thew wheat may be sown to come in about that time. Sown in April and fed off once or twice a good result should be obtained.



Thew Wheat at Kangaroo Valley.

Farmers favour it.

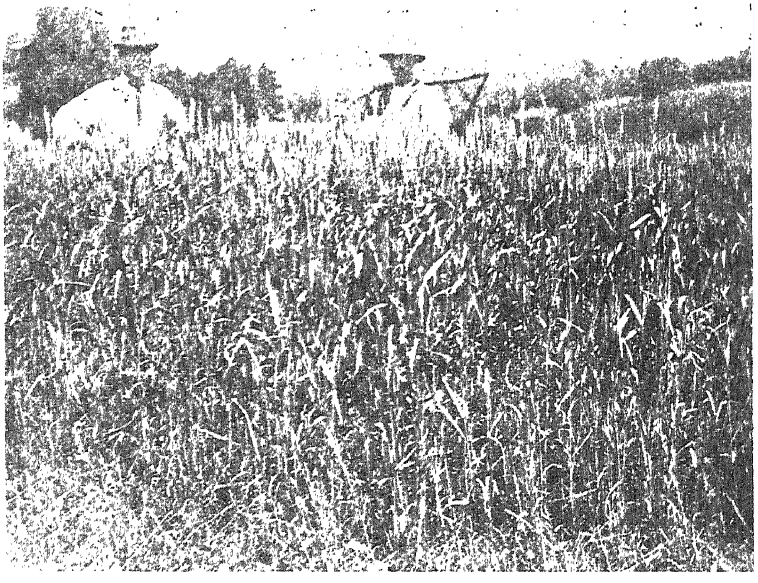
There was a great demand for seed of Thew last planting, and through the Department supplies were obtained for Dapto, Kangaroo Valley, and Tilba districts, the Dapto Agricultural Association—now well known for progressive measures — secured a truck load of seed for the farmers of the district, and sold it at cost price. Seed has been saved in some cases from the plots, but as the work has to be carried out by out-of-date methods it is not very profitable, and the return is much affected by the ravages of birds.

Many fine crops of Thew wheat were noticed on farms at Tilba. A nice crop of about 5 feet in height and very even was to be seen on Mr. Hoyer's farm, whilst Mr. John Bate of the same district had a very nice early crop, independent of the plots. At Kangaroo Valley there were many good crops, indeed there was rivalry among the farmers as to who had the tallest, and many fine samples were brought to the Barrengarry Butter Factory by suppliers to show the height the crop had attained. The best exhibit was some few inches over 6 feet. At Mittagong the Thew blocks were exceptionally fine—quite the best crops noticed anywhere on the highlands. The blocks were eventually turned into hay of first-class quality.

John Brown.

On the plots eight areas of John Brown wheat returned an average of 6 tons 13 cwt. per acre. This wheat is well liked by many farmers, as it carries a better flag than Thew, and stools better. It is not so early as

Thew, nor is it so rust resistant, yet it is to be strongly recommended for the South Coast both as a green fodder and hay wheat. It does remarkably well at Kangaroo Valley, Moruya, and Pambula.



Thew Wheat, manured, at Farm Home, Mittagong.



Thew Wheat at Pambula.

Medeah and Huguenot.

fodder varieties on account of having solid stems and being very sweet." As a rule the returns are very heavy. These two varieties are recommended to follow on after Thew and John Brown as green fodder, but not for hay.

Warren not so Suitable.

Warren wheat did not prove so well suited to coastal conditions as the before-mentioned varieties. There was no evidence of rust, but as regards bulk and period of growth it has not proved during the past two years' trials as suitable as others.



Thew Wheat at Farm Home, Mittagong. Manured and Unmanured.

Firbank.

I would recommend that Firbank be tried in place of Warren in next season's experiments. Three plots of Firbank were tried, viz., at Kangaroo Valley, Bega, and Mittagong. Judging by the result at Kangaroo Valley, it should be a most desirable wheat for green fodder and hay. It matured earlier than Thew, and grew very well indeed at Bega, where all the wheat plots were kept down by rabbits, and it was rather late before the plot was wire netted. It has always done well at Mittagong. Unfortunately it was a bit on the dry side when the return was secured, whilst other varieties were more succulent.

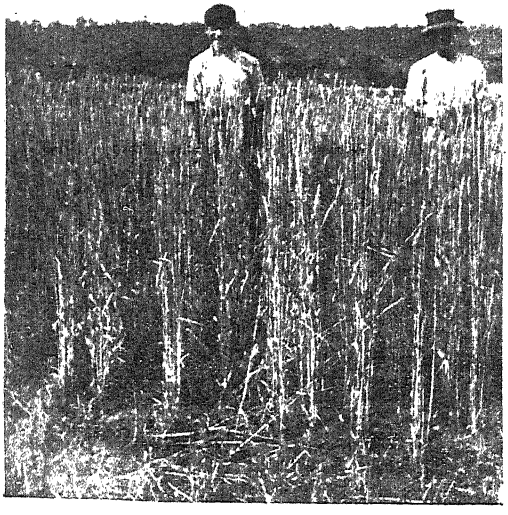
A couple of plots of Cleveland wheat were sown. I would not recommend any further sowings of this variety on the South Coast owing to its



John Brown Wheat at Pambula.

Manurial Trials.

Manurial trials were carried out with superphosphate at the rate of ½ cwt. and 1 cwt. per acre, and also with a mixture containing superphosphate, sulphate of ammonia, and sulphate of potash. The results are not as satisfactory as one might desire. They show that ½ cwt. of superphosphate on the average gave better returns than the larger quantity—a result which is worthy of further experiment. The complete manure, costing 9s. 9d. per acre, did not give such good returns on the average as ½ cwt. of superphosphate, and, considering the increased cost, further trials are needed before it can be recommended.



Firbank Wheat at Farm Home, Mittagong.

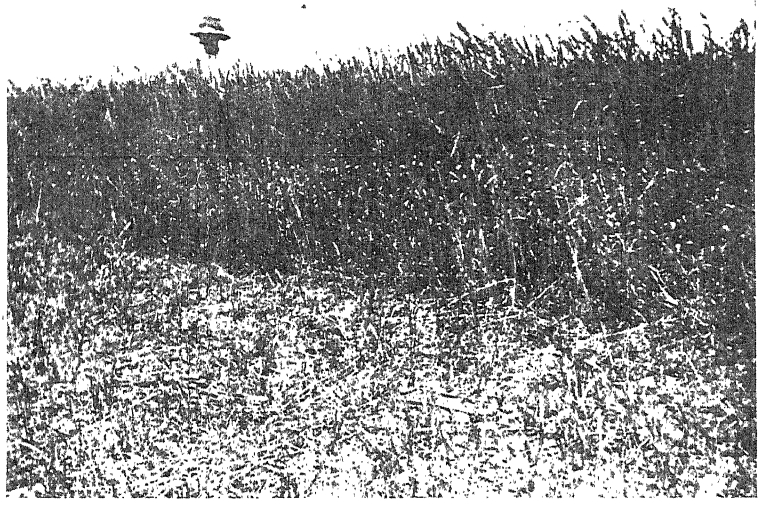
Drills Recommended.

The value of the drill must be recommended to South Coast farmers. It

brings about a more even distribution of seed and manure. and effects economy in time and material, one bushel of seed being sufficient where two are required for broadcasting. It is pleasing to be able to record that some of the more progressive farmers on the Coast are purchasing drills for the coming season.

Trials with Oats.

A manurial trial, similar to the trial in the wheat section, was carried out with Algerian oats. The results are unsatisfactory as far as the effects of the manures are concerned, for the same reason as in the case of the wheat manurial experiments. Until the manures are drilled in very little satisfaction will be obtained. In point of yield there is very little to complain of, as in every case the returns were very good.



Wheat Plots at Moruya.

Pambula Plot.

The plot at Pambula was much commented on throughout that district, it being acknowledged one of the best plots ever seen. It was sown on the 25th March, and the return for green fodder was taken when the crop was in a very succulent state on the 29th October. I inspected the plots on the 24th September, and the oats were then 4 feet 3 inches high without any appearance of the ear. At the time of cutting they were over 6 feet high. I attribute the high returns to the fact that the paddock was heavily limed two years ago for lucerne. The lucerne failed and the paddock was ploughed up again.

Comparison with Wheat.

On all the plots, oats compared badly with wheat as regards early maturity. At Pambula the oats were growing 219 days from sowing time to harvest; comparing this with the returns from the wheat the difference is very noticeable. As regards the amount of green feed, oats give a larger return, but they are discounted as a green fodder as they do not come in when most required. Herein lies the value of wheat for early fodder.

Winter Fodder Experiments, South Coast District, 1912.

Yield of Green Fodder per Acre.

Wheat Variety Trial.

Variety.	C. T. Stiles, Kanoona.	J. H. Martin, Pambula.	J. Chittick, Kangaroo Valley.	L. Carr, Unanderra.	Sir Wm. McMillan, Albion Park.	J. R. Milne, Moruya.	John Bate, Tilba Tilba.	Farm Home, Mittagong.	Average.
	t. c. qr.	t. c. qr.	t. c. qr.	t. c. qr.	t. c. qr.	t. c. qr.	t. c. qr.	t. c. qr.	t. c. qr.
John Brown	3 0 0	8 14 0	8 15 0	2 5 0	10 2 0	6 14 0	7 10 0	6 5 0	6 13 0
Medeah	3 11 0	11 3 0	8 15 0	3 10 0	11 14 0	5 3 0	....	....	7 6 0
Huguenot	4 6 0	7 14 0	7 5 2	3 0 0	6 0 0	6 2 0	14 7 0	....	6 18 1
Warren	2 17 0	7 8 0	4 18 2	1 11 0	10 5 0	4 10 0	7 8 0	....	5 11 0
Firbank	3 13 0	....	6 8 0	....	....	....	....	4 11 0	4 17 1
Cleveland	2 17 0	....	....	....	....	....	....	4 2 0	3 9 2
Thew	4 17 0	5 11 1	4 14 0	2 12 0	10 14 0	5 13 0	5 14 1	7 16 0	5 18 3

Manurial Trial.

Thew Wheat.

Superphosphate ½ cwt. per acre.	4 11 0	6 14 1	7 11 0	3 13 0	12 5 0	6 4 0	5 5 2	....	6 11 3
Superphosphate 1 cwt. per acre.	4 17 0	5 11 1	4 14 0	2 12 0	10 14 0	5 13 0	5 14 1	7 16 0	5 18 3
Unmanured	4 0 0	5 14 1	5 18 0	0 15 3	7 0 0	3 19 0	4 6 3	9 14 0	5 3 1
Complete mixture	6 0 0	7 11 1	6 9 0	1 6 3	9 14 0	4 15 0	5 15 2	10 0 0	6 8 3

Manurial Trial.

Algerian Oats.

	C. T. Stiles, Kanoona.	J. H. Martin, Pambula.	J. R. Milne, Moruya.	Sir Wm. McMillan, Albion Park.	Farm Home, Mittagong.	Average.
	t. c. qr.	t. c. qr.	t. c. qr.	t. c. qr.	t. c. qr.	t. c. qr.
Superphosphate ½ cwt. per acre	9 2 0	16 12 0	9 0 0	9 17 0	....	11 2 3
Superphosphate 1 cwt. per acre	10 14 0	15 0 0	8 18 0	13 12 0	....	12 1 0
Unmanured	8 17 0	9 0 0	7 15 0	....	7 2 0	8 3 2
Complete mixture	9 8 0	16 17 0	7 8 0	11 8 0	6 17 0	10 7 2

White-flowering Passion Flower.

(*Passiflora alba*, Link and Otto.)

INJURIOUS TO STOCK.

EDWIN CHEEL, Botanic Gardens.

IN November last, Mr. V. Davis brought in some specimens of a passion flower, which he had found growing wild on the Richmond River, and reported that cattle had died through eating the vine. After carefully examining the specimens, I find it is *Passiflora alba*, Link and Otto, which has apparently escaped from cultivation.

It is a native of Brazil, which has been under cultivation for many years in Europe, and which apparently has been introduced into Australia, and has spread in various parts of this State, as well as in Queensland.

In the National Herbarium, Sydney Botanic Gardens, we have specimens from George's Creek, *viâ* Kempsey, collected by Mr. J. L. Boorman, in January, 1907; from near Sydney, collected by Mr. L. Stephenson, in November, 1909; from Otford, collected by Mr. Boorman, in January, 1899; and from Jamberoo, collected by Mr. A. Noble, in December, 1909. There is also an imperfect specimen from Lismore, sent in by Messrs. McKenzie and Thorpe, veterinarians, in July, 1909, and stated to be poisonous to stock, which appears to belong to this species, but the specimen is too imperfect to be quite certain if it belongs to this species.

It will be seen from the above that the species has spread into many localities in this State, and as it is reported to be very injurious to cattle, it should be eradicated as soon as possible. According to a "Report on Experiments with the Wild Passion-flower Vine," in connection with the death of cattle in the Beaudesert district, Queensland, published in the *Queensland Agricultural Journal*, February, 1910, p. 88, by Dr. Sydney Dodd, F.R.C.V.S., principal Veterinary Surgeon and Bacteriologist, there seems to be no doubt as to the harmful effect of this plant on cattle.

In addition to the above, there are four species indigenous to this State, including *P. Herbertiana*, Lindl.; *P. brachystephanea*, F.v.M; *P. cinnabarina*, Lindl.; and *P. aurantia*, Forst. (*P. Banksii*, Benth.). These are all more or less common in the coastal districts, but so far have not been suspected as harmful to stock. In addition, I have found *P. coerulea*, Linn., at Bulli, and apparently a white-flowering form of this latter species at Peakhurst, both forms of *coerulea*, which have probably escaped from cultivation.

The chief characteristics by which *P. alba* may be distinguished from the native species are as follow:—The vine is quite glabrous, with comparatively small 3-lobed leaves, on relatively long, slender petioles; lobes oblong, obtuse,

the central nerve of each lobe ending in a short point, and in the sinuses of the lobes there are glandular teeth; stipules ovate-lanceolate, acute, cordate at the base, about 1-inch long. The flowers are greenish-white, about 2½ inches diameter, on stalks nearly equalling the leaves; coronet threads slender, a little more than half as long as the petals; anthers yellow. Fruits, oblong, about 1½ inch long, with whitish, pitted seeds.

The white-flowering form of *P. coerulea*, found at Peakhurst, has similar coloured flowers to those of *P. alba*, but the leaves are quite different, having from 5 to 7 lobes. The native species are described in the "Handbook of the Flora of New South Wales," by Moore and Betche, the flowers being of a reddish or orange colour. *P. edulis*, the edible passionfruit, is too well-known to need any special mention here.

Trials of American Cape Barley.

Two samples of American Cape Barley, Nos. 3 and 4 respectively, were received by the Department early in 1912, and sent to Wagga Experiment Farm for trial. The Experimentalist, Mr. R. W. McDiarmid, reports that both yielded fairly well last season. They are both six-rowed and comparatively early maturing, but they do not possess any special qualities. No. 3 yielded at the rate of 3⅔ lb. per row, equal to approximately 40 bushels per acre. No. 4 yielded at the rate of 4 lb. per row, equal to about 46 bushels per acre.

Trials of Imported Oats.

During June, 1912, small packets of oats seed of two different varieties were received from the Bureau of Plant Industry, United States Department of Agriculture, in response to a request from this Department for these and other varieties. They were forwarded to Cowra Experiment Farm, to be tried on the experiment plots there.

Mr. J. T. Pridham, Plant Breeder, now reports with regard to them that the "Black Bell" and "Great Black Mogul" oats are too late in maturing to be useful to us. The grain is of a brownish-black colour, and the stalk is too coarse to be suitable for hay in districts where Algerian oats are grown. They ripen about eighteen days later than that variety.

Two other packets were received in August, 1912, too late for the growing season. Mr. Pridham reports that one of these is Swedish Select, which has been grown before at Cowra from a packet of seed previously received from America. It is also a late maturing oat; straw rather coarse; resembles Potato oats. The other variety (unnamed) has been held over for trial this season.

Prickly Pear Burner.

Gasoline Torch.

H. C. COGGINS, Assistant Inspector in charge of Prickly Pear Experiments.

From American publications it appears that in the arid and semi-arid regions of the United States, such as Texas and Mexico, the prickly-pear burner or gasoline torch is commonly in use for singeing the spines off the pear. This method has superseded the old method of singeing the spines over a bush fire.

Senator J. H. McColl, in his report on prickly pear in America to the Commonwealth Government, describes the burner thus :—

The gasoline is put into a small tank strongly made of brass, and riveted. There is a brass cast head on it to which all the fittings are screwed on. These tanks are tested to 100 lb. pressure to the square inch, and have a small pump attached like that on a Primus stove for keeping the pressure on the burner at about 15 lb. to the square inch. The tank is slung over the right shoulder of a man, lying under his left arm. There is a brass pipe about 6 feet long connected with the tank working on a double joint, on the end of which is the burner. In burning pear the man brings the tank under his arm, takes the pipe in his right hand, and working the pump puts the pressure on the burner and lights it. He then moves about the cactus, passing the flame from the burner in and around the leaves of the pear. This he can do without coming in contact with the thorns himself. The machine weighs complete, 18 lb. It is stated the machine has been found to be most suitable and economical contrivance to deal with prickly pear for fodder purposes. It is easily handled and perfectly safe, provided ordinary care is exercised in following the directions for using carefully.



The Gasoline Torch used for burning the spines of Prickly Pear.

Seven of the burners were imported from America by the Lands Department, and they have been handed over to this Department for trial. I recently used one of them on some pear at Scone, and found that the pear

well scorched was readily eaten by the cattle, but the operator must judge for himself as to the degree of burning required. If the pear is too much burnt, cattle scour more than when the pear is only scorched to singe the spines off.

It is not advisable to use the machine during windy weather, as the blast will not be nearly so effective.

It is estimated that one man with a machine can burn enough pear in one day to feed 350 head of cattle; each beast will consume on an average 150 lb. of pear per day. The burner will consume 6 to 7 gallons of gasoline at a cost of 1s. 6d. per gallon.

Great care should be taken to keep stock away from water immediately after feeding on pear, as bloat is caused, and although it does not affect cattle used to pear to any great extent, it is dangerous to stock fed solely on pear for the first time. All stock should be gradually accustomed to pear.

Experiments carried out in this State prove that the machine is of great value in times of drought when fodder is scarce. Messrs. Alexander Bros., of Bulga, N.S.W., speak very highly of it, and state that they had 276 store bullocks during the drought, the whole of which were fed on pear for a period of six months, and fattened on this fodder alone. Messrs. Alexander Bros. say that the burner is a great success when feed is scarce.

A machine was also lent to Mr. H. Munro, of Keera Station, Inverell, and he considers that it is an excellent machine for the purpose required of it—that is, to destroy the thorns so that stock may cultivate a habit of eating the pear, and thus check the growth and seeding.

It is stated that the burner may be used for any other purpose a gasoline torch is applied to, such as burning off old paint, destroying insect pests on fruit trees, or burning up grass and weeds on lawns, gardens, &c.

The Sighting Board.

On the subject of the use of the sighting board in planting out an orchard or vineyard, as described in the *Agricultural Gazette* for January, page 70, Mr. H. M. Propstring, "Wirega," Warren, writes:—

I would like to say I used the board in 1900, and for several years afterward, and it was very slow—too many pegs. I have since used a thin piece of twisted wire, about one-third the diameter of wire clothes line. Put two nails in a batten, the distance apart that the trees or cuttings are to be planted, and measure off the wire, splitting the twisted wire at each distance and tying in the split a short piece of string. Mark out the paddock or orchard by pegging the whole of the base with pegs at the string markers; then after striking a right angle extended to the opposite side of the paddock, put in another row of pegs. This should give two rows of pegs, one on either side of the paddock. Then start at one end and from the base stretch the wire from the first peg in one row to the first in the one across the paddock, and—this is the point—before removing the wire plant at each piece of string. I can say from my own experience the time taken will be easily cut in half, and the squares will be exact. I have had 2,000 trees planted this year by this system.

Note.—For planting on a large scale it is generally found necessary to use the sight board in order to secure the greatest accuracy, and as a rule it is found more expeditious.—Geo. Valder.

Prune-growing.

W. J. ALLEN.

THE prune industry is now beginning to engage attention in this State, and there is a growing demand for the product (dried and green) which promises well for the industry. Prunes are a paying crop, and many parts of this State are well adapted for growing them. From 150 trees at Bathurst orchard 3 tons 1 cwt. of dried fruit were obtained last year, and when disposed of in the open market an average price of 8d. per lb. was obtained, or a total amount of over £225. The trees were 15 years old, and there was nothing exceptional in their conditions, which makes it all the stranger that this State should be importing largely, at a high price, a fruit that we can produce equally as well here at a good profit.

Climate.

The principal conditions to be desired for the production of a bright prune are moisture and sunshine, which give an earlier and more perfectly ripened fruit. In this respect districts such as Wagga, Young, Albury, Koorawatha and Parkes commend themselves. A district that is coming to the front in prune production is Batlow, and I have inspected and sampled some very fine quality prunes from the orchards in that district. During dry seasons, where irrigation is not practised, prunes often drop heavily before being fully developed, and those which remain are small and of inferior quality.

Soil.

Prunes thrive best in loamy soil which contains a high percentage of lime and potash. The prune-tree is a gross feeder, its limbs growing oftentimes several feet in the one season, so whatever the soil it must be good, and it must also be well drained.

Subsoiling.

It is considered that our heavier soils, or those with a clayey subsoil, are improved by subsoiling, as it loosens them up and puts them in almost as perfect condition as possible for the reception of the young fruit-trees. Such a soil will conserve and retain more moisture than a hard soil; it also warms up better and allows the roots of the young trees to reach out and downwards. Young trees planted on such land will make a good growth and furnish into strong trees sooner than those planted on land not so treated.

Planting Trees.

When planting the trees care should be exercised, as, unlike a farm crop, the trees are to stand for many years, and the proper treatment in the early stages is a great aid to future success. The following particulars will be found important in all planting, and should be given due attention.

The tree should be set a little deeper in the soil than it stood in the nursery row; the roots must not be long uncovered, and any bruised ones should be shortened back to healthy wood. Every care must be taken to get the tree into its natural environment as quickly as possible.

The soil should be firmed well about the roots of the trees, which should be laid out in approximately their natural position, the hole being large and roomy.

Stocks for the Prune.

The prune may be propagated in many ways, either by suckers taken from around the trunks of old trees, or by budding or grafting. Suckers are not



A sample of the Prune crop in the orchard at Wagga Experiment Farm.

generally used, as their habit of again sending up suckers condemns their use. The stocks best suited for the prune in this State are the Myrobalan and Marianna Plum. Peach stock is sometimes used on sandy soils, the prune making a good union with it.

The Myrobalan Plum is propagated from either cuttings or pits, the latter being preferable, as a seedling generally makes the best root system. The Myrobalan never suckers, and it will thrive in a wetter and colder soil than most other stock for stone fruit.

The Marianna grows very well from cuttings, and is particularly suited for sandy soils. We have found at the Government orchard at Wagga that

Robe de Sergeant prune is doing better when worked on Prune d'Agen that has already been worked on the Myrobalan than when it is worked on the Myrobalan direct.

Distance Apart.

It is an almost universal fault to plant trees too close together. Successful growers have found this out after years of experience. Trees are gross feeders, and necessarily require plenty of room and moisture. Having the trees planted widely apart allows of a greater area for the conservation of moisture in the drier districts, and provides better working conditions; cultivation is more easily carried out, spraying may be more thoroughly done, and above all it will give a well formed, strong tree. The prune-tree should be planted from 22 to 24 feet apart.



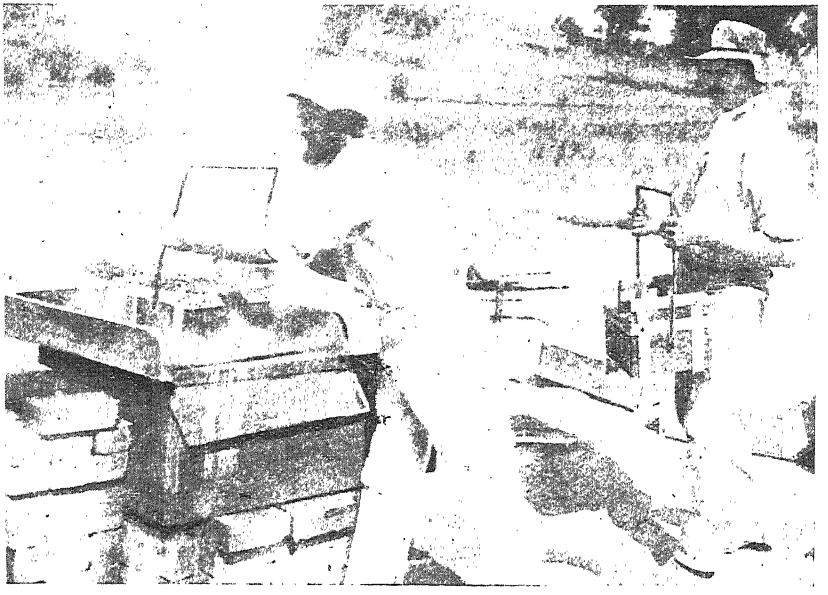
Prune-harvesting in the orchard at Wagga Experiment Farm.

Pruning.

To prune intelligently, the habit of growth of the tree, whether upright, spreading, or close-growing should be studied. In fact, in practice it is necessary to give every variety of fruit somewhat different treatment. For all practical purposes a tree embodying the following should give satisfactory results: A medium, low, roundish, symmetrical top, upon which the fruit may be easily thinned and picked, easily sprayed, and upon which there are strong branches that will not break with a load of fruit, and which will shelter the stem from the sun.

Cultivation.

There can be no doubt of the great benefit to be derived from thorough cultivation. To no fruit does this apply more forcibly than the prune. The fruit and tree being such heavy feeders, require every available amount of plant food. Cultivation should begin as early in the spring as possible. Early cultivation is important since it warms up the soil, gets it in good mechanical condition and kills the young weeds. This should be continued frequently thereafter until about March or April in the drier climates, or according to the season and the young growth which the trees have made.



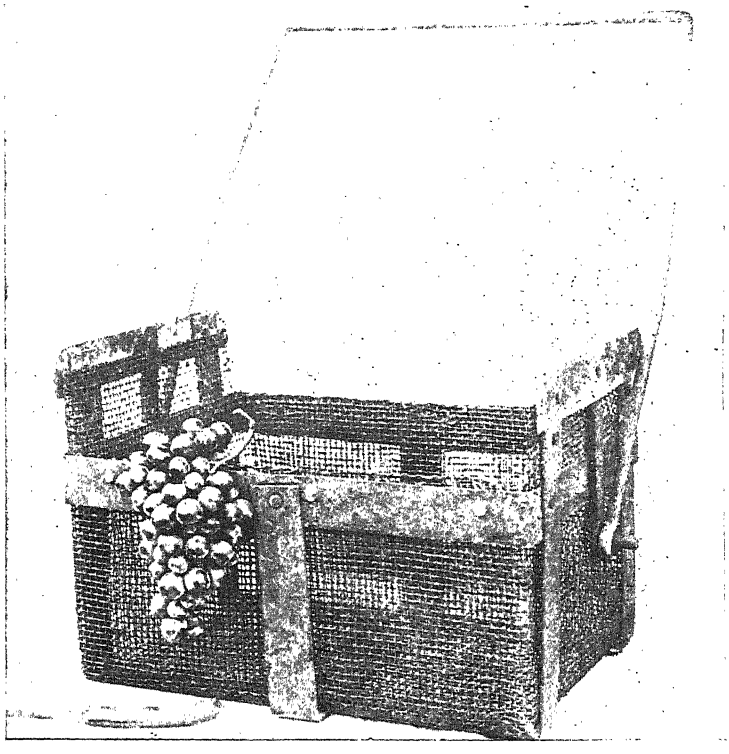
Dipping Sultanas and Prunes at Wagga Orchard.

Every orchard is so greatly influenced by special soil and conditions that it is hard to lay down any hard-and-fast rules as to the best treatment for every case; just what proper cultivation is must be determined by every grower for every orchard and every season.

In young orchards it is advisable to plough the land thoroughly early every spring. The later cultivation may be carried out with the cultivator, which with a minimum expenditure of time and labour will destroy weeds and keep the surface soil loose and friable. There are such a number of good implements that there need be no trouble in finding one suitable for any purpose.

Spring-tooth cultivators, and set-tooth cultivators, disc harrows, and smoothing harrows all have their places. The spring-tooth cultivator finds great favour in the orchards throughout this State. The frequency with which we should cultivate depends upon the soil, season, and purpose. In

the warmer districts, cultivating once a fortnight may not be too often when it is aimed at conserving moisture. A hard crust should never be allowed to form or weeds to become established. The cultivator should endeavour to leave the soil soft and fine, so as to retain as much moisture as possible. The soil should be worked close up to the trees, and the latter need not be pruned high to accomplish this.



Dipping-basket for immersing raisins or prunes in lye solution.

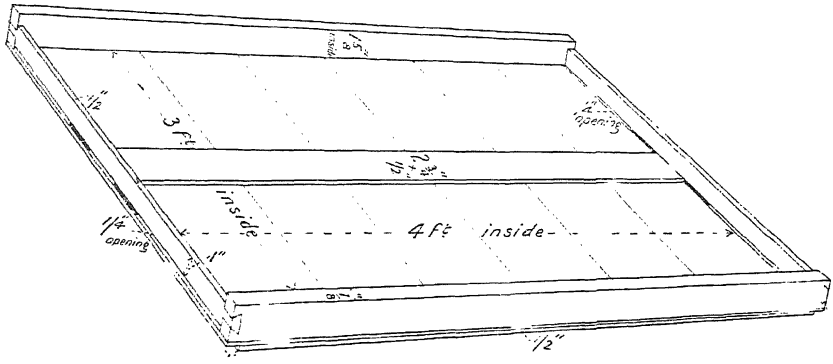
Green Manuring.

This question is now beginning to engage attention, and there seems to be every reason for this interest. That thorough cultivation during the summer months, followed by the sowing down of a suitable crop to grow during the winter whilst the tree is practically at rest gives good results, is evidenced by the strong and healthy growth of orchards where this practice is carried out. One merit of such a procedure is that the unsightly crop of weeds, which often springs up after the summer's cultivation, is destroyed. This is no doubt beneficial and would assist in the future working of the orchard, as the old saying is that "one year's seeding is seven years' weeding." Further than this, it is generally considered that the mechanical condition of

the soil is improved since it does not dry out so quickly in the spring and it adds very greatly to the vegetable matter (or humus) in the soil. Crops that are giving good results when used for green manuring are barley, rye, vetches, peas and cowpeas.

Thinning the Fruit.

This practice is a good one where fruit sets at all heavily, as there can be no doubt that better prices are realised for fruit that is of good quality combined with size. The quantity or fruit in bushels will be as great, if not greater, on the thinned as on the unthinned tree, and you have for the extra work of thinning a handsome and much more valuable product. With trees that have had their fruit thinned, there are of course many less pits, and large fruit, mostly with a watery flesh. For the formation of the excessive number of pits in the fruits on unthinned trees, it requires a much greater quantity of the mineral elements of the soil, and since these are the elements



Drying-tray.

most apt to be wanting and most difficult to obtain, it is obvious that the growth of a tree, overloaded with fruit, is checked, its vitality weakened, and in the end productiveness lessened.

No set rule can be laid down for thinning. The quantity of the fruit removed must vary with the size and vigour of the tree, the variety and the way in which the tree has been pruned.

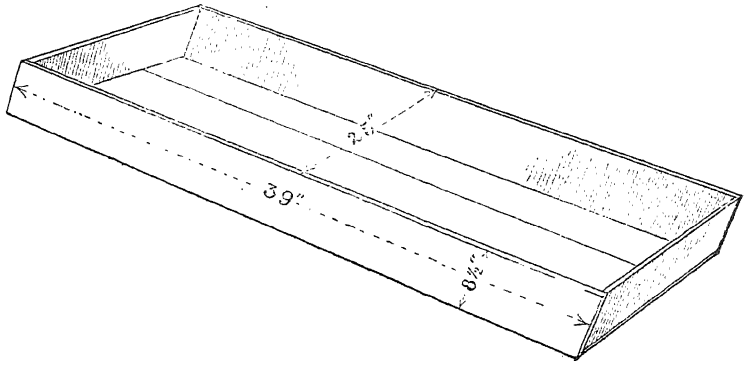
The work is much facilitated if the tree has been well pruned, since pruning in itself reduces the number of fruits to be removed, and makes it easier to get at the fruit on the tree.

Varieties.

In the warmer districts of this State the Prune d'Agen and Robe de Sergeant have proved most suitable. At Bathow the Silver Sugar and Golden are doing particularly well.

Prune d'Agen.—The following description of the Prune d'Agen and other prunes as grown in California, as well as other information on culture and curing, is condensed from the reports of the Board of Horticulture of the

State of California, and from Professor E. J. Wickson's work on Californian fruits :—"Branches of medium strength, bent at their very short intermodes, deep brown on the shady side, whitish on the sunny, smooth; wood buds, small, conical, not very sharp; fruit buds, medium size, ovoid, not very sharp; leaves, medium size, oval, elliptic or obovate, with a deeply-crenated edge; petioles of middling length and strength, wine-coloured, and slightly downey; general hue of the foliage, a light green, stiffness of all the leaves; petioles of the leaves well spread out and diverging, are the striking characteristics of the tree. Fruit, medium size, ovoid or egg shaped, more tapering on the side of the stock than on the side of the pistillary point, around which it is very obtuse; a very deep suture on one side, with a scarcely perceptible furrow on the other; skin, thick and firm, parting from



Sweat-box used for handling dried fruits.

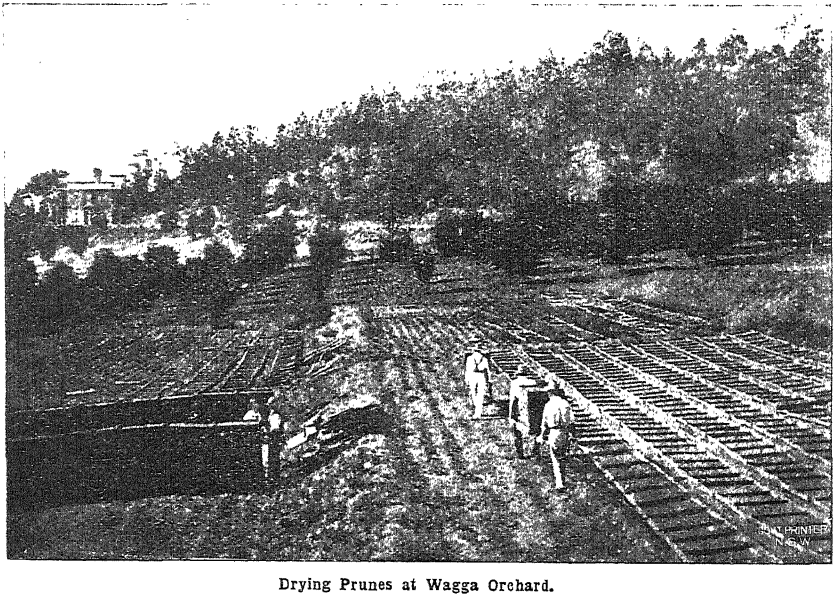
the flesh, at first of a light purple, tinged with green; at maturity the purple becomes very dark, and covered with a thick, bluish bloom; fruit stalk somewhat long and slender, inserted in a narrow and shallow cavity; flesh yellow, very sweet, rich, and sugary; pit small, ellipsoid, flattened, and most often separating from the flesh."

Prune d'Agen.—Following description of Prune d'Agen, or Robe de Sergeant, or Prune d'Ente, as grown in France, taken from the French Dictionary of Agriculture, is by J. A. Barral :—"Tree very prolific; fruit oblong, swollen towards the middle, violet rose colour, a little spotted, with very small dots, white or black; flesh yellow, sweet, with a strong perfume developed by drying; the pit is oval, oblate, obtuse, adhering to the flesh by some points on the side."

Robe de Sergeant.—Robe de Sergeant is considered in France as a synonym of the Prune d'Ente or Prune d'Agen, as it is also by Downing, but in California and in New South Wales it is considered a distinct variety. The Californian description is as follows :—"Fruit medium size, oval, skin deep purple, approaching to black, and covered with a thick blue bloom, flesh greenish, yellow, sweet and well-flavoured, sugary, rich and delicious, slightly

adhering to the stone ; a valuable drying and preserving variety. The tree is quite an upright grower, and has a much broader leaf than the Prune d'Agen. A peculiarity of this prune is that it cannot be worked on any other than plum stock except by double working. When worked on peach or almond it sooner or later severs from the stock." We have found at the Government orchard at Wagga that this variety does better when top-worked on another variety of plum that has already been worked on the Myrobalan.

Silver Prune.—Originated in Oregon, U.S.A. Probably a seedling of Coe's Golden Drop, which it closely resembles, but is a better bearer. It is a first-class drying plum owing to its firm flesh, large size, and fine flavour.

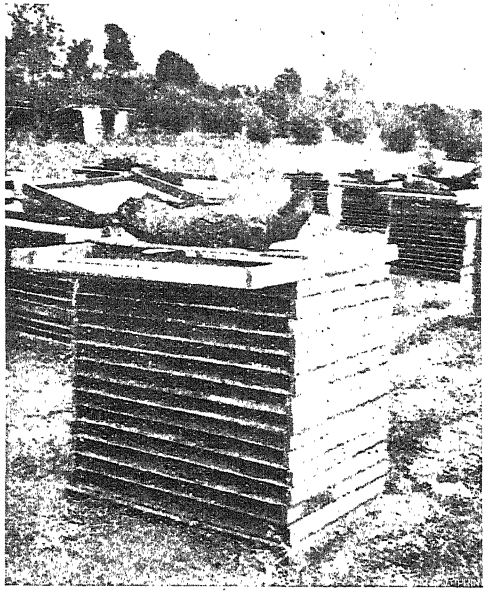


Drying Prunes at Wagga Orchard.

Fruit large, oval ; a little necked, one side larger than the other, skin light yellow, marked with numerous dark-red dots on the sunny side. Flesh yellow, firm, adhering to the pit, sweet and fine flavour. Tree a rapid grower, but does not bear as young as other varieties.

German Prune.—This prune is grown under a large number of names, and is probably the variety most extensively planted in Germany and all Central Europe. The following description and drawing are taken from "Downing" :—"Fruit long oval, nearly 2 inches long, peculiarly swollen on one side and drawn out towards the stalk. Suture distinctly marked, skin purple, with a thick blue bloom, stalk three-fourths of an inch long, slender, slightly inserted ; flesh firm, green, sweet, and pleasant ; separates easily from the stone, which is flat, very long and a little curved." In the east of France this prune is largely used for distilling purposes.

In addition to the prunes of which I have given a description, there are several other varieties of more or less merit, such as the Bulgarian, Brignole, Hungarian or Pond's Seedling, or erroneously Gros Prune d'Agen, Tragedy, Fellenburg or Italian, Wangenheim, St. Martins, Hungarian Date, and several of the d'Ente type. Space will not permit me to give a detailed description of these varieties, nor do I think it necessary to do so in an article of this description, as if prune growing is to be made a success in this colony it will be advisable to stick to one or two varieties, so as to be able to produce a class of fruit that will make a name for itself in the markets of the world as the Californian prune has done.



Proper way to stack trays during wet or hot weather.

The prune most extensively grown in California and in the district of France that produces the finest prunes of commerce, viz., the Department of Lot-et-Garonne and neighbouring districts, the fruit of which is shipped from Bordeaux, is the Prune d'Agen, or, as it is often called, the Prune d'Ente.

Splendour.—This variety is productive, firm, rich, sugary, early, and twice the size of the French prune; freestone.

Sugar.—This fruit is even in size and very large; early; yellow flesh, and rich in sugar.

Fellenburg or Italian Prune.—Fruit medium to large size, long, oval; skin dark purple; flesh rich yellow; clingstone; rather a light cropper.

Golden Prune.—A prune closely resembling Coe's Golden Drop, being, however, a little more rounded, with slightly different colour and flavour. The dried product is of fair quality.

Curing the Fruit.

In our Departmental orchards the Prune d'Agen (which when worked twice is found to be a more regular cropper) and Robe de Sergeant have proved the two best varieties for drying purposes. There are one or two other varieties which make a good commercial article in such districts as Batlow and similar localities, but the above-mentioned are the varieties most largely planted, as they are in every respect suitable for the purpose. In the warmer climates the Robe de Sergeant carries a better crop than the Prune d'Agen. The fruit hangs better during dry seasons and ripens earlier, and has the additional advantage of being suitable for both dessert and cooking purposes.

In the cooler districts, such as Bathurst, both kinds do well, while at the Kameruka orchard, near Bega, the manager tells me that the Prune d'Agen is superior to the Robe de Sergeant. It will therefore be seen that it is as well to make some inquiry in order to ascertain which variety is doing best before planting out an orchard.

Drying.

The fruit should not be picked until it is thoroughly ripe; then dip it in a solution consisting of 1 lb. of caustic soda to 10 gallons of boiling water, immersing the fruit from five to ten seconds, according to the toughness of the skin, or just long enough to slightly crack the skins. Should the lye-dip be made stronger, the prunes would not require such a long immersion. If the skins are cracked too much they will present a very rough appearance when dry, and will be liable to go sugary.

The fruit should be placed in wire or perforated metal baskets, and dipped into the boiling solution. The tank should be about 24 inches deep in order to contain 18 inches of boiling solution. The advantage of having the solution this depth is that the liquid is more easily kept at boiling point, and it removes any grit attached to the fruit.

The fruit is then spread on trays to dry, and in the case of silver or light-coloured prunes, they should be put into the fumigator just long enough to set the colour well. After this the prunes are placed in the sun or evaporator as the case may be. In the latter event the temperature should be about 130 degrees to start, and gradually increased to 180 or 200 degrees, this usually covering from one to two days, according to the size of the fruit. If the temperature is too high when the fruit is placed in the evaporator, the prunes are liable to burst and adhere to the trays, and the juice will run and stick to the trays and other prunes. The fruit when dried should be pliable; and when removed from the evaporator it should be allowed to lie in sweat-boxes for at least four weeks, taking care while sweating is in progress to turn at least once each week, so as to even up; then re-dipped for five minutes in boiling water, to which a little salt and a quantity of broken or damaged prunes have been added; then again dried; and finally graded and neatly packed in boxes, lined with white paper.

There is a machine which is used to prick the skins in place of dipping, which some people claim does equally good work, if not better; others use a combined dipper and pricker. Our experience is that the dipping answers for all practical purposes.

The length of time required for drying the different varieties in the evaporator varies according to size. The smallest are sometimes dried in less than a day, while the largest take two days.

The fruit should be properly graded before being packed, and classed as follows:—20 to 30's, 30 to 40's, 40 to 50's, &c., up to 120 prunes to the pound.

Insect and Fungus Pests of Prunes.

Disease.	What to use.	When to spray.	Remarks.
Insects—			
San José scale ..	Red oil, lime and sulphur, and fumigation.	As late as possible before buds burst in spring.	
Curculio	Arsenate of lead ...	Just as buds opening; again when petals have fallen.	The fact that the beetles feed upon the foliage of blooming trees just about the time fruit is forming, makes the spraying method effective. Up to the present the Department has not found this pest troublesome.
Borers	Watch the trees; dig out borers wherever castings appear.	.....	
Fruit-fly	Regularly remove and burn or boil any infected and fallen fruit.	.....	
Red-mites ...	Lime and sulphur, or red oil.	As late as possible before buds burst in spring.	
Aphis	Tobacco wash, Sunlight soap, red-oil emulsion.	As soon as observed. Repeat as often as necessary.	It is found necessary to give three or four sprayings to keep this pest in check.
Fungi—			
Brown fruit-rot...	Bordeaux mixture; lime and sulphur.	As late as possible, when buds are bursting in spring; again after fruit has set.	If the season proves to be a wet one, an extra spraying will be necessary.
Shot-hole rust ...	Bordeaux mixture; lime and sulphur.	When buds are expanding and bursting in spring.	

New Table Grapes.

Short Description of 25 New Varieties imported in 1909, now growing at the Viticultural Station, Howlong.

M. BLUNNO.

Frederiction.—Black, fairly big bunch, winged, oblong berry, good flavour. This year ripened on 7th February.

Schiradzouli Violet.—Colour between pink and purple, medium-sized bunch, rather loose; berry more than medium size, oblong. Ripened 23rd February.

Ahmeur Mouara.—Not true to name.

Muscat d'Eissenstad.—Black, medium-sized bunch, medium-sized berry, round; hardly any Muscat flavour. Hardly worth keeping.

Muscat de Hongrie.—White, rather small close bunch, berry the size of Chasselas, round; very sweet and delicate; very fine and marked Muscat flavour; very prolific. Ripened 31st January.

Olivette Rose.—Big bunch, winged, loose, big pinkish berries, olive shaped; not much flavour. Probably flavour would improve if bunches were thinned. Ripened end of March.

Clairette Rose.—Medium-sized bunches, conical shaped, berries medium-sized, pink, very good flavour. Ripened 6th March.

Trifere du Japon.—Black, cylindrical shaped bunch, very loose, big berries, firm flesh, ripens rather unevenly, may be because of its being the first crop, good flavour.

Olivette de Vendemian.—Good showy white grapes, big conical shouldered bunches, delicate wax hue, rather close, big berries, oval; flavour of the bigger bunches rather indifferent—far better flavour in the smaller bunches, which are looser. I think flavour would improve if berries on bigger bunches were thinned out.

Doigt de Déesse.—Very big bunches, oblong and shouldered, big olive-shaped berries, turning to pink and amber in the smaller bunches in particular. Flavour rather indifferent, but it would improve, I think, if the berries on the bigger bunches were thinned. Flavour of the smaller bunches more pronounced and pleasant. In my opinion, the Doigt de Déesse is closely allied to, if not one and the same with, the Lady's Finger.

Schiradzouli Blanc.—Medium-sized, loose bunches, big oblong berries, white, better flavour than the Schiradzouli Violet. Ripened 2nd February.

Insolia Nera.—Not true to name.

Mantua de Malaga.—Very big, cylindrical bunches, white, medium-sized berry, slightly oval, white firm flesh, not much flavour, which I think would improve if berries were thinned out. Ripened 10th February.

Kabiron.—Has not fruited yet. It will be identified next year.

Foster's Seedling.—A variety already known in Australia. Big, short bunch, compact, medium-sized white berry, roundish, flesh rather watery, very good flavour. In 1911 it ripened on the 6th March; in 1912, the season being unusually early, it ripened on the 2nd February.

Molinera Gorda.—Long loose bunches, reddish, big, roundish berries; flesh firm. It ripened on the 14th February.

Spiran Noir.—Cylindrical bunches, close berried; berries black, rather small, round; firm flesh, good flavour, good cropper.

Maravilla de Malaga.—Long bunch, fairly compact, medium-sized berries of a dark red hue; firm flesh, not much flavour; likely to carry well. Ripened 14th February.

Henab.—Long, loose bunch, red, big oblong berries; flesh firm; fairly good flavour; showy grape; likely to be a good carrier. In 1911 it ripened on the 3rd March; in 1912, on the 20th March.

Malakoff Isjum.—Rather small, short bunch, compact, long, pointed berry, much bigger at the base, black, with a tinge of red; firm flesh; good flavour; likely to carry well. Ripened end of March.

Muscat de Caminada.—Medium-sized bunch, fairly long, berries above medium size, round, white; firm flesh. Some bunches do not set properly, which may be due to the vine being very young yet. Fine flavour of Muscat. A really good variety, likely to carry well. In 1911 ripened early in March; in 1912, ripened towards the end of the same month.

Bellino.—Bunch big and long; black, round berries; firm flesh; good flavour; size, medium to large. Ripened 31st January.

Ochivi Blanc.—Large and long bunch; large berries, oval, amber colour; flesh fairly firm; good flavour. Ripened 7th February.

Routh Chaouch.—Not true to name. There are some vines that have not borne fruit yet. The row will be left another year to see what the fruit of the latter will be like.

Park de Versailles.—Not a good sort, neither the black nor the white variety. Both small berried; very soft flesh; very indifferent grapes. To be regrafted with some other kind.

All these grapes are grafted on Rupestris du Lot. They are growing in a fairly stiff loam. Average rainfall, 22 inches.

Agricultural Bureau of New South Wales.

Branch.	Honorary Secretary.
Albury	Mr. J. D. Lankester, Albury.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Beckom	Mr. S. Stinson, Beckom.
Bonville	Mr. H. B. Faviell, Bonville.
Bungalong	Mr. E. Hughes, Oakleigh, Cowra Road, *viâ* Cowra.
Cardiff	Mr. F. B. Cherry, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Collie	Mr. C. J. Rowcliff.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coreen-Burraja	Mr. H. Vickers, Coreen, *viâ* Corowa.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Derain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. Duffy, Henty.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit.
Kellyville	Mr. C. F. Boughton, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S Stening, Little Plain, *viâ* Inverell.
Lower Portland	Mr. G. Gosper, Lower Portland.
Mangrove Mountain ...	Mr. G. T. Hunt, Mangrove Mountain, *viâ* Gosford.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Moruya	Mr. P. Flynn, Moruya.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
New Italy	Mr. F. A. Morandini, New Italy.
Nimbin	Mr. J. H Hutchinson, Nimbin.
Orangeville	Mr. C. Duck.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose-Kareela	Mr. L. Pieremont, "Vila," Penrose.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Spring Hill	Mr. J. A. Henry, Spring Hill.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Tallawang	Mr. J. E. Hansall, Tallawang.
Toronto	Mr. J. G. Desreaux, "Esmond," Toronto.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and Honorary Secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th, to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the Branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Samples of Wheat.

It has been decided to supply branches of the Agricultural Bureau, free of charge, with samples of grain and bunches of heads of the twenty-two varieties of wheat recommended by the Department for cultivation in various parts of the State. These comprise the leading varieties recommended for grain, hay, dual purposes, and green fodder. The collection should prove a valuable acquisition, especially for identification purposes, to members of branches in wheat-growing districts.

Branches intending to avail themselves of this offer should now do so without delay, by making application to the Department through their Honorary Secretaries.

Demonstrations in Pruning and Fruit-packing.

Honorary secretaries are reminded that all requests for pruning or packing demonstrations for this year should reach the Department as early as possible, in order that arrangements may be made in ample time.

Demonstrations in Clearing Land and Subsoiling with Explosives.

Arrangements have been made for demonstrations in clearing land and subsoiling with explosives, to be given by Mr. H. C. Coggins before members of the Gerringong, Wetherill Park, and Kellyville branches of the Agricultural Bureau. A limited number of demonstrations will be given by Mr. Coggins, and branches intending to avail themselves of this offer are requested to send in early application.

NOTES AND REPORTS FROM BRANCHES.

Albury.

At the Town Hall, Albury, on the 21st January, Mr. W. Froggatt, Government Entomologist, gave a lantern lecture, illustrating a large number of insects. At the close of the lecture a number of questions were answered by Mr. Froggatt, who was accorded a hearty vote of thanks.

Carlingford.

At the last meeting of the branch, Mr. Rumsey, of Dundas, addressed members on the subject of the Murrumbidgee Irrigation scheme :—

Mr Rumsey had recently visited the scene of this great national undertaking in order to prepare a report thereon for the British Immigration League. By means of figures and diagrams, he conveyed to his hearers an idea of the vastness of the scheme, and described the immense amount of work that had been accomplished in preparing for the first settlers on the area. Mr. Rumsey gave details of the different classes of soil to be found there, and exhibited samples of same. In the course of his remarks, Mr. Rumsey gave much information that would be of guidance and encouragement to intending applicants for blocks on the irrigation area, and of the ultimate success of the project he held the most sanguine opinions.

Collie.

A branch of the Agricultural Bureau has been formed at Collie The following gentlemen were elected office-bearers :—Mr. W. Meyer, Chairman ; Mr. C. W. Brown, Vice-Chairman ; Mr. L. E. Tink, Treasurer ; Mr. C. J. Rowcliff, Secretary.

Coonabarabran.

The usual monthly meeting of the above branch was held in the Shire Hall, on the 4th January. Mr. H. W. Copeland presided ; there was a good attendance of members. Mr. C. Crane, from the Wagga Experiment Farm, was also present.

Lamb-Raising Combined with Mixed Farming.

Mr. D. Cameron read an interesting paper on "Lamb-raising combined with Mixed Farming," from which the following notes are taken :—

I spent my boyhood days in the north of Scotland on a sheep farm that carried 13,000 sheep, which is a very large number for that country. Scotland is a very cold and bleak country in the winter, with heavy snows and frosts, and as a consequence sheep have to be provided for to keep them in condition during the winter months. This was done by having all the arable lands ploughed and sown with turnips for food for the bad times of the year, and for keeping the ewes in condition for the lambing time in the spring, as every lamb saved meant at least £1 to the owner.

Further, my experience extends over twenty-five years in Australia and New Zealand, all the time connected with the land, and three years in New Zealand solely with the raising of fat lambs. The land in the Coonabarabran district is of very poor quality in its natural state, but by clearing and ploughing, and top dressing with lime, it can be greatly improved and sweetened.

My idea is that ewes can be kept in good condition through the winter, and whilst carrying the lambs by giving them say 1½ lb. of silage, turnips, mangels (if these can be grown), or lucerne. The silage may be made of corn, which grows almost any season. As long as the ewe is kept in good condition through the winter she is growing wool all the time, which ought to amount to about 12 lb., and at lambing time the most of cross-bred ewes will produce two lambs, which they will rear and keep in good condition if properly fed. After lambing time, in the autumn, for a thousand ewes and lambs the farmer ought to grow from 40 to 50 acres of rape, which is one of the fastest growing crops there is, and also the most fattening ; the ground requires good ploughing, and the seed careful sowing and harrowing, as if buried too deep it is inclined not to come up.

The next question is, how is all this going to pay? My answer is, with cross-bred ewes one is almost sure to get 100 per cent. of lambs, that is if the ewes are properly fed as I have pointed out. In fact, in New Zealand I have seen as many as 160 per cent. of lambs from cross-breds properly fed; but in this district we ought to be satisfied with 100 per cent., which in a flock of 1,000 would represent £500. If we were able to fatten them, and had the advantage of railway communication, the returns ought to amount to a great deal more. From the wool we ought to get a return of 7s. per sheep, which would amount to £350, or a total of £850. I have known of small farmers in New Zealand getting a return of as much as £1 7s. per sheep, where lamb raising is carried on with mixed farming.

I have not the slightest doubt that a great deal could be done in this district by artificially feeding stock during the winter months. I have also no doubt that cross-breds would do much better in this district than Merinos, and I would point to the exhibits at our shows, which, to my mind, clearly show that this district is not very suitable for Merinos.

Discussion.—In reply to questions, Mr. Cameron said in a district such as this, which was similar to New Zealand and Scotland, much could be done by improving the country and growing winter feed. He estimated that fat lambs, five months old, would realise about 10s., or with railway communications about 14s. per head For export purposes lambs should range from 32 to 36 lb. each. In ordinary seasons rape should be in fit condition for putting sheep on in six weeks from date of sowing. In this district rape should in that time be fit for topping off prime lambs for market. Such is the case at Canterbury, New Zealand, where the natural grasses are no better than here. He would recommend dividing the rape paddock off with netting, eating off (but not too close) one portion at a time, and he would also take stock off at night.

Mr. N. Featherstone congratulated Mr. Cameron on the able paper read to the meeting, and said with regard to rape growing, he had had considerable experience, both in New Zealand and in this district. For the past three seasons he had grown it most successfully on his farm at Bugaldi; one year the crop was so prolific that sheep grazing upon it could not be seen. He sowed about the middle of October, and in six weeks he put his sheep on, and it kept them going right up to the new year.

Mr. Parkins said he had a peculiar experience with rape. Last year he sowed a few pounds at the same time as wheat. He only put about two dozen sheep on it. At first the sheep entirely ignored the rape, and only ate the wheat, but after sampling the rape they could not be kept off it. He was quite satisfied rape could be grown here at any season.

Mr. Copeland had had a long experience among sheep, and admitted that rape had good fattening propensities. Still there was the preparing of the sheep for lamb-raising purposes prior to them being put on rape nourishment. First he advised stock-owners to go through their flocks, picking out the barren ewes. The next step was to get the rams in good condition. Every five or seven days the rams and ewes should be yarded all night to prevent rams drawing away. The ewes should not be too fat at lambing time; the lambs should be kept healthy. He recommended, as a tonic for worms, doses of salts and sulphur. When taking lambs away from the ewes, great care should be taken to put them into really good paddocks. For cross breeding, he favoured Leicester rams with Merino ewes, contending that owing to the Shropshire lamb's head being so large, many ewes died at lambing, and, further, the Leicester cross-bred wool was always saleable, and finer than that of the Lincoln-Merino cross. The Leicester-Merino cross produces a lamb with finer, and therefore more saleable, wool, which is a great advantage if the lambs should have to be held for shearing.

Mr. Cameron said he did not consider the Leicester a good wool-producer.

Mr. Hosking said about sixteen years ago he went in for cross-breeding Lincoln rams with Merino ewes. His experience was that very little loss resulted so long as the rams were placed with maiden ewes, but with aged ewes the losses were fully 20 per cent. He was satisfied that mixed farming will have to be resorted to by stock-owners and agriculturists in this district, owing to the limited areas each holder will have. Some years ago he held a holding of 930 acres, upon which he ran 1,000 sheep per year; now he could not keep 200 on the same land. Still, by having 100 acres netted and cultivated, besides keeping 200 sheep on that area, he was able to retain a sufficient quantity of hay. By putting the 930 acres under cultivation, 1,500 sheep could be carried, and a large quantity of farming produce retained for market, so that a profit would be made from both sources. There was no doubt that since 1890 stock had been decreasing rapidly all over the world, and for this reason better prices would be obtainable, and he would recommend owners to look well after their stock in the future.

In reply to questions, Mr. Cameron said an animal well fed is worth two starved ones. The same would apply here as in Scotland, where sheep are worth £3 each. If a man

grew strongly; when about 1 foot high a species of fly ate into the plants, with the result that four or five rows died out altogether. The remainder stooled out well and looked healthy, and showed a good amount of seed. This plot was planted on a good deep soil, and was kept free from weeds, but the dry weather was against it at times.

The next plot visited was that of Mr. C. Battaglini. The seed in this plot came up well and strong; it was sown in rows about the same distance apart as plot No. 1. It grew to about 2 feet high, stooled very strongly, and showed a good quantity of seed. The clover is on a good soil, but as in the first case the dry weather was against it. The plot was kept free from weeds.

The next visit was to Mr. A. Mansfield's, which is about 5 miles north of Leech's Gully, and over one of the worst and roughest roads in the district. This plot was sown similarly to the two first. The plants had grown very strongly, and stooled well. Part of this clover was cut down when about 18 inches high; since then it had grown, reaching the height of the original plants. This plot was showing a better growth than the two first mentioned, owing to receiving about 2 inches more rain. The soil is of a sandy loam. The cultivation was clean and free from weeds.

Discussion.—Mr. J. Weir said, as far as he could see, Egyptian clover was all right if nursed and looked after. Although the experiments with these small plots could not positively demonstrate whether it would do well in the district, it would do better, no doubt, after the roots got a good hold in the ground.

Mr. C. Battaglini said he could not put much faith in the Egyptian clover, as he thought the plant wanted plenty of moisture, and, therefore, would not do in a district subject to dry spells. He thought that any one that could get Egyptian clover to grow well could grow lucerne to perfection; he considered lucerne far more vigorous in growth than the clover.

Mr. A. Mansfield thought Egyptian clover would do well in this district if once started. He said that the patch he cut down when about 18 inches high showed far more vigorous growth than the patch which was not cut. Mr. Mansfield thought it was not a plant that would stand much feeding off as he considered it too tender.

Little Plain.

In order to increase membership the members of Little Plain branch have decided to hold a ploughing carnival this year.

These functions are usually well attended and successful. Other branches might follow the example set by Little Plain.

New Italy.

The destruction of flying foxes was the subject discussed by members of the New Italy branch at their last meeting.

Orangeville.

A branch of the Bureau has been formed at Orangeville, and the following gentlemen have been elected office-bearers for the ensuing year:—Mr. W. J. Moulder, Chairman; Messrs. W. Stevens and R. H. Taylor, Vice-Chairmen; Mr. A. McWhinter, Hon. Treasurer; Mr. C. Duck, Hon. Secretary.

Penrose-Kareela.

The members of the Penrose and Kareela branches of the Agricultural Bureau have decided to amalgamate, and in future the branch will be known as Penrose-Kareela.

A demonstration in orchard operations was given to members of the Penrose branch by Mr. J. G. R. Bryant, Assistant Fruit Expert, during January, when a large number of gentlemen interested in the fruit industry were present.

The young orchards in this district are looking particularly well, and it is anticipated that 100 acres of new orchard will be planted this year.

Poultry in the Orchard.

This was the subject of an address given by Mr. Bradshaw, Poultry Expert, to the members of the Kareela branch on 11th January.

The audience were told the importance of the industry, which was shown by the increasing prices for poultry products for the past half-dozen years, that of eggs amounting to over 45 per cent., a feature which does not apply to any other product of the land, whether stock or crop. The great expansion made in the industry within the past six years was attributed to the excellent Sydney markets for poultry products, carcases, and eggs. These good markets were brought about by the great demand, and the prosperity of our fast increasing urban and suburban population. The audience were told that there was no possibility of the markets in the future being glutted through excessive production. The determination of the community to live well, and their ability to do so, was an assurance of the continuance of the splendid prices for dressed poultry and eggs, and those who kept fowls need have no fear of any decline in the demand.

There were very many families in the State making a good living and to spare solely by their fowls, though they had rent to pay and every ounce of food to buy. This being so, in how much better position should orchardists be who kept fowls as a side issue, with no direct charge against them for rent, and where from one-third to one-half of the food bill can be saved by feeding the various unmarketable produce. The unlimited supply of green stuff on such places, the advantages of manure for the trees, the eradication of insect pests, &c., place the orchardist above all others as the man who should be able to make the most money out of poultry farming.

The industry has proved so profitable during the last few years, especially to orchardists, that some of them are now stocking flocks of 1,000 birds.

Gooseberry Cultivation.

At the last meeting of the above branch Mr. N. B. Gibbons read an interesting paper on gooseberry cultivation.

Mr. Gibbons said :—The cultivation of gooseberries, from a commercial point of view, should receive more attention in this district than has been the case hitherto. The climatic conditions are very favourable, and though the land is not as good as might be wished for, yet it has been found to produce many kinds of excellent fruits, amongst which is the gooseberry.

For those about to try gooseberry cultivation, I wish to point out that one of the first things to consider is the preparation of the land and choice of position. It is always best that the latter should be in a sheltered and moist piece of ground. The land should be thoroughly cleaned, and worked to a good depth before planting. This is necessary in order to give the roots an opportunity to get well down, and also to conserve the moisture.

The next thing to consider is the variety to plant. There are a number of good varieties, but there is only one best, and it rests entirely with the intending grower to decide which one that shall be. We ourselves have tried a number of varieties, and our experience has led us to decide in favour of the Roaring Lion. It is a strong, vigorous, and hardy bush, and a prolific bearer ; the berries are large, thin-skinned, and well suited for market. Our method is always to prune well back, and always to a top bud, in order to make the growth as upright as possible, thus keeping the bush well off the ground. The roots should be carefully pruned, and any buds showing amongst the roots that are likely to send up suckers should be cut or rubbed off. We have found that where the bushes will persist in sending their roots to the surface they never thrive well, as the ground gets too hot and dry during the summer months. It also makes cultivation more difficult. In planting in this district 6 feet apart would be sufficient if it is intended to do the cultivating by hand, but if it is intended to work in between the bushes with a horse, then 7 feet would not be too much, or even 8 feet.

When planting it is advisable to mix a little bonedust with the soil. Care should always be taken not to let manure of any kind come in direct contact with the roots. No more manure is needed then until the third or fourth year, when the bushes begin to carry a fair quantity of berries. We then manure very lightly at first, and each year as the bushes get larger increase the quantity. The mixture I would recommend is made up as follows :—Half bonedust and half Shirley's No. 5, with 1¼ cwt. of sulphate of potash added to every 15 cwt. of this mixture.

This season we manured in this way a ¼-acre block of our eight-year-old bushes, giving them at the rate of 15 cwt. per acre. The block consisted of 262 bushes. Our returns were 220 cases, which would be equal to 880 cases per acre, or nearly 9 tons.

This, to my mind, clearly shows that it pays to manure judiciously. It has often been said that artificial manures are quickly washed out of the soil. Our experience goes to show that this is not so.

A fairly good rainfall during the growing season is essential for success. Another point to remember is that where artificial manures are being continually used, the land should be well limed every four years.

Our methods of working are to prune during June and July, manuring early in August. We do not lay the manure thick round the bushes, but spread it lightly over the entire space between the bushes and then fork it well into the soil; then, until picking time, the surface is kept loose with the hoe.

When picking the fruit it is inadvisable to wait until the berries are full grown, but as soon as they are large enough to ensure getting top market price, we go over the whole of the bushes picking the largest ones only. In this manner the consignments are of uniform size, and the bushes, relieved of the largest berries, have an opportunity of quickly developing the smaller ones.

In marketing berries, the aim should be to make them as attractive as possible when the cases are opened up. In order to do this, each case is neatly papered. Care must be taken that the berries are not hot when put in the cases, else they will wilt or become soft.

After the picking is done we go over the ground once more with the hoe to soften it, so that it will absorb as much of the rainfall as possible, and also keep the weeds in check, otherwise they would soon smother the bushes. They are then left till pruning time comes round again.

One of the advantages of the gooseberry culture is that the fruit comes in early, and there is always a good demand for it. Then again, no matter how bad the season may be, we can nearly always depend on having a crop of some sort.

Another distinct advantage is that on a very small area of land, one can have a quick and sure return whilst clearing other land, and waiting for fruit trees to come into bearing. The greatest trouble we have had to contend with has been the "white ants"; almost every season we lose some, and frequently the best of our bushes. We never know that they are there until the bush is completely ruined.

Walli.

At a meeting of the members of the Walli Branch of the Agricultural Bureau the following gentlemen were elected office-bearers for this year:—Mr. J. Adams, Chairman; Mr. E. A. Thomas, Vice-Chairman and Treasurer; Mr. A. V. Bloomfield, Secretary.

Wolseley Park.

The monthly meeting of this branch was held on the 25th January and was well attended.

A discussion took place on the question, "Which is the most profitable for ordinary farm work in this district—horse power or engine power?"

The matter was well threshed out by those present. Some members contended that farmers, and especially dairy-farmers, should aim at keeping a minimum of dry stock on their holdings, and should endeavour to do as much work as possible with engine power.

Others again contended that engines could be done without for ordinary farm work, but that the horse could not be done without.

Mr. BAGUST said that on a small farm horses corresponding in value with an engine would do more work than the engine, and would prove also a better investment.

Mr. GARNER said horses were more economical than engines. Horses could do all the work on a farm that could be done by an engine, besides much work that could not be done with an engine.

After a lengthy discussion, the Chairman asked the opinion of the meeting on the subject. The majority favoured the working of the horse and engine in conjunction, on the ground that the engines are more suitable for certain kinds of work than the horse, and *vice versâ*.

A resolution was carried that each subject for discussion should be chosen at each meeting, and dealt with at the following one.

Members will thus have a month's notice of each intended subject, and so will have ample time in which to prepare notes, &c.

Several other branches are following this plan, and it is said to work admirably.

Orchard Notes.

W. J. ALLEN.

MARCH.

Cultivation.

WHEREVER the weeds have been allowed to go unchecked, they should be turned under some time this month; and if crops for green manures—such as grey field-peas, tares, rape, or rye—are to be sown among the trees, they should be put in as early as possible. If, however, no crop is to be sown, it would be well to allow the land to remain in the rough state after ploughing. It will gradually mellow down and remain in good condition until it is time to plough it again next spring. Growers are still busy marketing their fruit, which, with the cultivation of the orchards and picking up and destroying diseased fruit, in accordance with the regulations under the Fruit Pests Act, keeps them going from early morning until late at night; but this is only what we anticipate, as harvesting time is always a busy season, be the crops what they may.

Grading and Packing Fruit.

The chief points in grading apples are:—Size, colour, freedom from disease, and uniformity through every case.

The export market generally demands a good, clean, medium-sized fruit, $2\frac{1}{2}$ inches being about the ideal, as the buyer generally wants what to the trade is known as a good count. Extra large fruit is not desirable, as these are generally coarse, and do not keep so well. As a general rule, three sizes are shipped ($2\frac{1}{2}$, $2\frac{3}{4}$, and 3 inches); with varieties such as Jonathan, that have good colour and do not run large, $2\frac{1}{4}$ will pay to ship. When grading, any fruit which shows the slightest sign of disease should certainly be thrown out.

It is impossible to overestimate the importance of grading apples for market. It is a thing which cannot be overdone. Most fruit is practically unsaleable without grading, and the better the grading the better it sells.

At our Bathurst Government orchard, when packing apples the following grades are adopted:—

Extra Choice—3 inches.

Extra fine specimens only, uniform in size, colour, and form, and without blemish.

Choice 1st—$2\frac{3}{4}$ inches.

Good fruit, not so fine as Extra Choice, uniform in size, colour, and form, and practically free from insect, injury, or defect.

Specially selected 2nd—2½ inches.

Mostly good eatable fruit, uniform, and not conspicuously marked by insect, fungus, or other damage.

Selected 3rd—2¼ inches.

Third grade, uniform, sound, and free from conspicuous injury.

Every grower's pack should be as good as his bond; no topping up, nor filling up corners with small apples: buyers want honestly packed goods, and they are usually willing to pay good prices for such. Each case should be filled with the same grade throughout; a few seconds or culls scattered in with a lot of prime fruit give the buyer an opportunity to discriminate against the whole package, and ruin the reputation of the grower.

Apples must be cool and dry before being packed. Heat and moisture promote decay. Each case should be well filled, with the contents placed firmly and snugly. Every day consignments are placed on the market showing evidence of careless packing. If growers would consider for one moment the average route travelled by a case of apples for market they might be a little more particular. The case is taken from the packing shed and put on the cart: it is then hauled, perhaps, for some miles over the average country road to the railway station. After bumping along in the train for some miles, it is again unloaded and placed in a lorry and hauled for several squares over the city streets to the boat, where it is unloaded again ready for shipment to its destination, when, after some more knocking about, it is opened for the inspection of the foreign buyer, and to compete against the fruit of the world. Unless the case has been well filled and packed before starting, it will reach the market in what is commonly known as "slack" condition. The numerous jarrings received *en route* will have caused the contents to settle and shrink, with the result that the case will only be partially full.

Buyers will not pay the price of full packages for those received only filled in part. Not only is the sale affected in this way, but loose packing invariably causes bruises and the general defacement of each specimen. Too tight packing must also be guarded against, as this generally results in bruising. There is a happy medium in packing that can only be learned by practical experience.

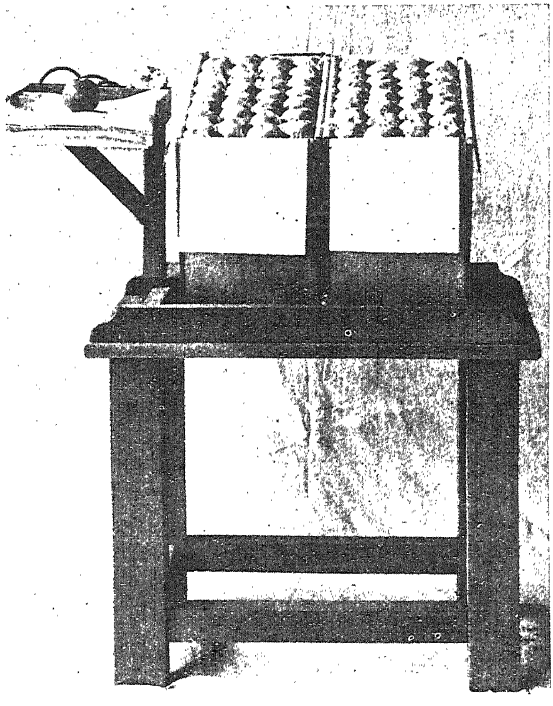
Wrapping.

Whether the apples should be wrapped or not depends somewhat on the variety and the grade of fruit. Wrapping has several advantages:—

1. It serves as a cushion in the case of delicate fruit.
2. It prevents rot and fungoid diseases from spreading from one fruit to another.
3. It maintains a more even temperature in the fruit.
4. The fruit has a somewhat more finished appearance when exposed for sale.
5. Wrappers keep the fruit firm and snug in the packages.

Disadvantages of wrapping :—

1. It adds to the cost of packing.
2. It prevents rapid cooling in cases where the fruit is not cool at the time of packing.



Apple-packing Stand, as used at Bathurst.

The table is constructed of pine, like a kitchen table, so that it will stand perfectly firm and bear a fair weight. Small reversible castors can be placed on the bottom of the legs so that the stands may be removed from place to place. Strong ledges or battens are affixed firmly to front and back at the top of the table so that the fruit case may be tilted on the back one and prevented from slipping by the front ledge, as shown. At the left-hand side of the table, a stand is affixed, with a ledged tray to carry the wrapping-paper, &c.

In making the table, the height should be such as to enable the packer to get his hands comfortably into the bottom of the case.

Proper wrappers can be purchased by the thousand for the various-sized fruits, and a 2½-inch fruit should not be wrapped in a paper large enough to accommodate a 3-inch fruit, nor should a 3-inch fruit have a wrapper put on it which has been cut to fit a 2½-inch specimen.

When packing for export, proper tables are necessary (see illustration) for holding the cases during the process of packing.

Strawberries.

The land should be in a good state of tilth, having been thoroughly worked to receive the young plants. If the intending planter has not raised the plants himself he should procure them from a successful grower, and see that the parent plants are strong, fruitful, and free from diseases. Distance of setting depends upon the character of the soil, freedom with which the variety selected sends out runners, &c. In good soils the rows should be from 3 to 4 feet apart, and the plants 18 inches apart in the row. Compactly growing varieties may be planted a little closer. This is called "hill" culture, and consists of growing each plant by itself in a hill, not allowing the runners to grow: consequently each plant becomes stalwart and large, and when properly attended to produces the very finest fruits.

Matted rows.—This system is generally adopted by large growers, as it requires less labour to attend to a large area. By the matted row system more berries are produced on an acre than by the hill culture, but the latter method gives larger and finer berries. The rows are set from 3 to 4 feet apart, and the plants about 15 inches apart in the row. When the runners start they may be so arranged that they form a continuous matted row. The grower can suit himself as to how wide he allows the row to run. Some allow the rows to become 2 feet wide, and others only 1, according to the distance apart the rows have been set. The runners can be kept in check after the row has attained the desired width by using a roller cutter, running up and down between the rows, or by the use of the spade or hoe.

Before planting the new plant, all dead leaves and runners should be removed, and the roots shortened by at least one-third of their length.

The following are the number of plants to the acre, at the distances mentioned:—

2 ft. x 1 ft. ...	= 21,780	3 ft. x 1 ft. ...	= 14,520
2 ft. x 1 ft. 6 in.	= 14,520	3 ft. x 1 ft. 6 in.	= 9,680
2 ft. x 2 ft. ...	= 10,890	4 ft. x 1 ft. ...	= 10,890
2 ft. x 1 ft. 6 in.	= 14,520	4 ft. x 1 ft. 6 in.	= 7,260

The following list comprises those varieties which at the present time are mostly grown for the best paying results:—Aurie, Annetta, Royal Sovereign, Captain, Trollope's Victoria, Edith, Marguerite, Sir Joseph Paxton, King Edward VII, Dr. Moree, Noble, Sunbeam, Melba.

Fruit Fly and Codlin Moth.

It seems almost incredible that any fruit-grower who is alive to his own interests would allow fly or moth-infested fruit to lie on the ground until the grubs have left them, but such is the case, and it is to these careless growers that we are usually indebted for the breeding and spreading of many of our pests. It is also these growers who give so much extra trouble to our Inspectors under the Fruit Pests Act, in seeing that no neglect takes place. It may be well for such careless growers to remember that they are a menace to their neighbours, and that by neglecting to pick up and destroy all fallen

and infested fruit, they are liable to a fine. Any fruit-grower would be quite justified in notifying the Department whenever he is sure that his neighbours are trying to shirk their responsibilities in this matter.

Budding.

It is rather late, but if the month should prove a warm one, it is quite possible that buds would still take if inserted in deciduous trees which are not producing either good fruits or satisfactory crops. Nursery stock may still be budded.

Preparing Land for Planting this coming Winter.

Clearing, grubbing, ploughing, and subsoiling, preparatory to planting, should be carried out as soon as possible now, and those who intend planting this coming winter, and who have not completed these operations, should lose no time in finishing this work, so that new land will have a little time to sweeten before the young trees are set, as well as to enable the orchardist to complete all planting operations early in the winter.

"Bitter Rot" in Apples.—*Gloeosporium fructigenum* (*G. versicolor.*)

The Bureau of Microbiology reports, regarding an apple sent to the Department of Agriculture for examination, that it is affected by the disease known as "Bitter Rot" or "Ripe Rot," which is caused by a fungus, one stage of which is known as *Gloeosporium fructigenum* (also as *G. versicolor.*) To the grower the disease is most obvious on the fruit. It hastens the period of ripening and causes the fruit to fall prematurely, or if the fruit is attacked when quite young it may remain hanging on the tree in a mummified condition. The fungus also forms cankers when present on the branches, and spores from these areas bring about the infection of the fruit. On the branches the fungus may form blackened, sunken patches, and the bark may be killed and crack and fall away. These canker spots may occur on small shoots, very often on the last year's fruit spurs, and also on the branches up to many inches in diameter. The fungus may also infect the new crop by spores produced in another stage of its life-history on old decayed apples and the mummified fruit. Hence in the treatment of the disease the source of infection must be first removed. All decayed and fallen fruit, and all mummified fruit on the trees should be collected and burned. Twigs and branches showing appearances of cracked or cankered areas should be cut away and also be burned, and any diseased patches on larger limbs cut out and the wounds dressed with tar. These operations can be carried out at once. If there is any fruit on the trees worth saving they should be sprayed with the lime-sulphur spray in the proportions of 6 lb. of lime, 12 lb. of sulphur and 200 gallons of water, or a weak Bordeaux mixture (about 3-3-50.) If commercial Bordeaux powder or the paste is used, it should be at about half the strength given. It will be found that if the fruit is advanced the Bordeaux mixture is more liable to russet the fruit than the lime-sulphur.

Following summer treatment on these lines the trees must be kept clean during the following winter and spring.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Irish Short-horn.	Limerick Lad (imp.)	.....	.....	Berry	*
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (im.)	Wollongbar Farm	*
,, ...	Imperialist ...	Florio	Lady Nancy of Minembah.	,, ,,	*
,, ...	March Pansy ...	Earl March ..	Australian Pansy	Grafton Farm ...	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
,, ..	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	,, ,,	*
,, ...	Elaine's Heir ...	Thessalian II ...	Wagga Elaine	Yanco Farm ...	*
,, ...	Jamaica Jack ...	Sir Jack ...	Rum Omelette (imp.).	Wollongbar Farm	*
,, ...	Royal Blood ...	Berry Melbourne	Calceolus ...	,, ,,	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie ..	Berry Farm ...	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Cowra Farm ...	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Swan Bay... ...	22 June, '13.
,, ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	Kyogle	28 Aug., '13.
,, ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Grafton Farm ...	†
,, ...	Prince Souvia ...	Vivid's Prince...	Souvenir(imp.)	Grafton	3 April, '13.
,, ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Casino	22 June, '13.
,, ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '13.
,, ...	Sunshine ...	King of the Roses	Princess Vivid	Grafton Farm ...	*
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	Claudius (imp.)	Golden Star II..	Claudia's Pride(imp.).	Tweed River ...	12 Aug., '13.
,, ...	Trengwainton VillageFavourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
,, ...	Good-bye ...	Western Duke...	Souvenir (imp.)	Casino	28 May, '13.
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Jones' Island ...	1 June, '13.
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (im.)	Pambula	1 May, '13.
,, ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Lismore	3 July, '13.
,, ...	Royal Preel ..	Itchen Royal ...	Hayes' Lily du Preel(imp.).	Murwillumbah ...	10 Nov., '13.
,, ..	Prince of Warren Wood (imp).	Kingsmoor Governor (1952)	Quail (7051)	Frederickton ...	1 May, '13.
,, ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Macksville ...	14 June, '13.
,, ...	Rosehill (imp.)..	Northesk (2073)	Faultless Footsteps (6132)	Raymond Terrace	19 June, '13.
,, ...	Duke of Orleans	Godolphin Arthur (1664)	Flower of the Preel 3rd (imp.)	H.A. College, Richmond	*
Ayrshire ...	Jamie's Heir ...	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ...	*
,, ...	Orphan Boy ..	Songster of Greystanes.	Rosamond ...	Glen Innes Farm..	*
,, ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A.College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin(imp.)	Bratha 4th ...	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed

Department of Agriculture,
Sydney, 3rd March, 1913.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

SHORTHORN.—Duke of Hampton: sire, Royal Hampton 10th (imp.); dam, Flower Girl; calved 14th May, 1911; colour, red and a little white. Price, **£15.**

Flower Girl is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy. Australian Pansy is by Airy Knight 2nd from Pansy 4th (imp.).

Flower Girl, on second calf, in thirty-three weeks, gave 4,513 lb. of milk, with a test of 3·7 per cent. butter-fat, and is still milking well. Forest Pansy gave 5,785 lb. of milk in forty-one weeks, yielding equal to 272 lb. of butter. Australian Pansy gave 5,822 lb. of milk on her first calf, with an average test of 3·8 per cent. butter-fat.

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—St. Michael of Wo longbar: sire, Trequean Mike (2103); dam, Polly 2nd of Roque Balan (imp.); calved 21st August, 1911. Price, **£40.**

Polly 2nd of Roque Balan (imp.) yielded 4,157 lb. of milk, equal to 235 lb. of butter.

* **Earl of Bath:** sire, Monsieur Beaucaire; dam, Miss Jasmine; calved 10th December, 1911. Price, **£35.**

HOLSTEIN COWS FOR SALE.

WOLLONGBAR EXPERIMENT FARM.

Name.	Date of Birth.	Sire.	Dam.	Price.
				£
Lolkje Field (not in calf) ...	12 Nov., 1904 ...	Garfield	Lolkje	20
Marjorie (in calf)	5 Sept., 1906 .	Chairman	Margaretha ...	30
Fraulein Arama (not in calf)..	4 Feb., 1907 ..	The Hague ...	Dina's Douwe ..	25
Marigold (not in calf) ...	25 Feb , 1907 ..	The Hague .	Margosa	25
Maggie Hague (in calf) ...	28 Aug., 1907 ...	The Hague ...	Maggie Obbe ...	30

H. C. L. ANDERSON, Under Secretary.

* This bull will be held until 21st instant, when, if more than one applicant, he will be balloted for.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

ACQUIRING LAND IN THE NORTHERN TERRITORY.—"T.R.D.": Applications for particulars of land in the Northern Territory should be addressed to the Secretary, Department of External Affairs, Melbourne.

ADDING RAISINS TO WINE.—"G.O.W.": There is nothing to forbid adding raisins to wine, but it would hardly correct the sourness of the wine. It would really only have the effect of sweetening the wine, and the sweetness would, to a certain extent, mask the sourness without relieving the wine of it.—M. BLUNNO.

CROSS-BREEDING OF DAIRY CATTLE FOR BUTTER PRODUCTION.—"J.C.D.": A number of experiments which we carried out with Guernsey cattle, Ayrshire cattle, and Shorthorn cattle went to show that we got the best results by using pure-bred Guernsey bulls, and if you are making a study of the matter it would be worth while to read the chapter in my recent book on dairying on the subject, as it gives all details as a result of crosses.

The Jersey-Ayrshire is a cross that has also done very well in some cases in the hands of private breeders, but personally I prefer the Jersey graded up to nearly pure rather than the ordinary cross.

The culling of cows for butter purposes must depend on the total butter production of the cow for the season, and this can only be judged by weighing the cow's milk night and morning at least once a month for a year, and having the milk tested at the same time. The cost would be very small, as the local factory would do the testing for you, and there is no trouble in calculating the result.—M. A. O'CALLAGHAN.

TO PROTECT A HAYSTACK.—"C.M.": The cheapest way to protect a haystack is to thatch it. Light tarpaulins cover the stack effectively, and are not very expensive.—GEO. VALDER.

BEETLES ATTACKING APRICOT TREES.—"K.P.A.S.": The beetles are the rose-coloured leaf beetle (*Monolepta rosæ*). It is very common in the north, and often does a lot of damage to the green foliage of citrus trees. Spraying with arsenate of lead, or Paris green, is the best way to deal with them.—W. W. FROGGATT.

CERTIFICATES OF SOUNDNESS.—"W.P.K.": A stallion holding a Victorian Life Certificate can compete at the Royal Agricultural Show in Sydney, without being examined again, if the horse stewards are quite satisfied that the horse presented is identical with the certificate. There is no occasion to have the animal re-examined, but usually New South Wales horse-owners present the animal to the examining officers for the purpose of exchanging the Victorian certificate for one of New South Wales.—VETERINARY OFFICERS.

PLANTING DORADILLO VINES.—"W.F.F.": These vines having been planted 10 feet by 6 feet for the distillery should be trained on permanent horizontal cordons, each carrying five to six spurs. Doradillos are vigorous vines and heavy bearers, and being planted fairly wide apart will stand this method of training and pruning. The vines, however, should be regularly manured.—M. BLUNNO.

GUINEA GRASS.—"J.H.J.": The specimen sent is *Panicum maximum* (Guinea grass), which is well adapted for the Northern River districts, its high fodder value having been already proved. The seed is very light, and consequently should be covered very lightly. It should be sown in the early spring after frosts have ceased. If sown for grazing the seed should be broadcasted and the harrow run over it, 5 lb. or 6 lb. per acre being sufficient. Before sowing, the land should be brought to a fine tilth and thoroughly cleaned. If sown to cut for fodder, the seed should be sown in drills about 5 feet apart, and the plants should be thinned out to about 3 feet apart in the rows, or the plants can be transplanted from a seed-bed to these distances.—GEORGE VALDER and E. BREAKWELL.

EARLY VARIETIES OF SEEDS.—"W.F.F.": Seeds retain their quality of earliness, even though planted late in the season for the purpose of raising seed for the next year. In most instances growers sow early varieties early, in order to get the crop in before the glut, and late varieties for the same purpose. "Early" simply means early maturing. As a rule, for the main crop a mid-season variety is used.—GEO. VALDER.

Variations in Weight of Wheat.

Whether wheat that has been stored for some six months weighs heavier than new wheat depends very much upon the condition of the wheat at the time of storing, and the conditions under which it is stored.

If a good, well-grown dry sample of wheat is put into store and the season is moist, or it is exported and therefore exposed to moist conditions, a decided increase is almost certain to occur.

If, on the other hand, the wheat is badly harvested, and is a moist, bleached sample, and it is kept under anything like dry conditions, the wheat is almost certain to decrease in weight.

Wheats vary considerably in this respect, and I do not know of any official figures having been taken with regard to the variation.—Geo. Valder.

A Dwarfed Pear Tree.

A photograph of a pear tree (Bon Chrêtien), heavily laden with good-sized fruits, has been received by the Fruit Expert. Though twelve years old, and surrounded by similarly treated trees of the same variety that are 10 feet to 12 feet high, this particular tree is only 6 feet high. The owner has been informed that it started bearing earlier than its neighbours, and has regularly carried a good crop. He intimated his intention to do something to make the tree put forth more growth.

In acknowledging the photograph, the Fruit Expert remarked: It is considered that the tree in question is worked on a quince stock, which would give it a dwarfed condition. To improve the size of the tree it will be necessary to apply a couple of loads of good, fresh, bush scrapings and mould, and if any stable manure is available a heavy dressing in the spring would assist the tree to put on growth.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1913.

Society.	Secretary.	Date.
Southern New England P. and A. Association, Uralla.	W. McCrossin ...	Mar. 4, 5
Mudgee A., P., H., and I. Association	P. J. Griffin ...	,, 4, 5, 6
Tenterfield P., A., and M. Society	F. W. Hoskin ...	,, 4, 5, 6
Cumnock P., A., and H. Association	K. A. Abernethy..	,, 5
Bega A., P., and H. Society	W. A. Zingel ...	,, 5, 6
Braidwood P., A., and H. Association...	L. Chapman ...	,, 5, 6
Bellinger River A. Society	J. F. Reynolds ...	,, 5, 6, 7
Camden A., H., and I. Society...	A. Thompson ...	,, 5, 6, 7

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1913.

Society.	Secretary.	Date.
Tumbarumba and Upper Murray P. and A. Society...	E. W. Figures ...	Mar. 5, 6, 7
Newcastle A., H., and I. Association	C. W. Donnelly ...	,, 5, 6, 7, 8
Crookwell A., P., and H. Society	M. P. Levy ...	,, 6, 7
Port Macquarie and Hastings District A. and H. Society	T. Dick	,, 6, 7
Berrima District A., H., and I. Society (Moss Vale)	I. Cullen	,, 6–8
Blayney A. and P. Association	H. R. Woolley ...	,, 11, 12
Gundagai A. Society	A. Elworthy ...	,, 11, 12
Central New England P. and A. Association (Glen Innes)	G. A. Priest ...	,, 11, 12, 13
Narrabri P., A., and H. Association	D. J. Bridge ...	,, 11, 12, 13
Molong P. and A. Association	W. J. Windred ...	,, 12
Bombala A. Society	W. G. Tweedie ...	,, 12, 13
Coramba District P., A., and H. Society	H. E. Hindmarsh	,, 12, 13
Macleay A., H., and I. Association	E. Weeks... ...	,, 12, 13, 14
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins ...	,, 12, 13, 14
Walcha P. and A. Association	J. N. Campbell ...	,, 12, 13, 14
Goulburn A., P., and H. Society	G. G. Harris ..	,, 13, 14, 15
Royal Agricultural Society, Sydney	H. M. Somer ...	,, 18–26
Cooma P. and A. Association	C. J. Walmsley ..	April 2, 3
Coonabarabran P. and A. Association	G. B. McEwen ...	,, 2, 3
Bathurst A., H., and P. Association	J. Bain	,, 2, 3, 4
Hunter River A. and H. Association	E. H. Fountain ...	,, 2–5
Wauchope P., A., and H. Society	A. D. Suters ..	,, 3, 4
Cobar P. and A. Association	D. H. Dunlop ...	,, 5, 6
Adaminaby P. and A. Association	W. Delaney ...	,, 9, 10
Gloucester A., H., and P. Association	S. J. Bignell ...	,, 9, 10
Quirindi P., A., and H. Association	Geo. Fowler ...	,, 9, 10
Clarence P. and A. Society (Grafton)	G. N. Small ...	,, 9, 10, 11
Orange A. and P. Society	W. Tanner ...	,, 9, 10, 11
Dorrigo A., H., and I. Society	W. R. Colwell ...	,, 10, 11
Hawkesbury District A. Association (Windsor) ...	H. S. Johnston ...	,, 10, 11, 12
Moree P. and A. Society	D. E. Kirkby ...	,, 15, 16, 17
Batlow A. Society	Tom Bowman ...	,, 16, 17
Dubbo P., A., and H. Association	F. Weston ...	,, 16, 17
Dungog A. and H. Association	C. E. Grant ...	,, 16, 17
Merriwa A. and P. Association...	V. Budden ...	,, 16, 17
Ulmarra P. and A. Society	R. N. Shaw ...	,, 22, 23
Upper Manning A. and H. Association (Wingham) ...	D. Stewart, junr...	,, 23, 24
Warialda P. and A. Association	A. J. Devine ...	,, 23, 24, 25
Richmond River A., H., and P. Society	D. S. Rayner ...	,, 29, 30
		May 1
Kyogle P., A., and H. Society	M. P. Dunlop ...	May 7, 8
Walgett A. Association	W. Neal	,, 21, 22
Deniliquin P. and A. Society	L. Harrison ...	July 17, 18
Murrumbidgee P. and A. Association (Wagga) ...	A. F. D. White ...	Aug. 19, 20, 21
Gunnedah P., A., and H. Association	M. C. Tweedie ...	,, 26, 27, 28
Parkes P., A., and H. Association	G. W. Seaborn ...	,, 27, 28
Ariah Park P., A., H., and I. Association	J. N. Taylor ...	Sept. 2, 3
Wellington P., A., and H. Society	A. E. Rotton ...	,, 2, 3
Manildra P. and A. Association	C. M. Podmore ...	,, 3
Germanton P., A., and H. Society	J. S. Stewart ...	,, 3, 4
Junee A. Association	T. C. Humphreys..	,, 3, 4
Young P. and A. Association	T. H. Tester ..	,, 9, 10, 11
Albury and Border P., A., and H. Society	W. I. Johnson ...	,, 9, 10, 11
Cootamundra A., P., H., and I. Association	T. Williams ...	,, 16, 17
Cowra P., A., and H. Association	G. S. Fisher ...	,, 16, 17
Murrumburrah P., A., and I. Association	J. A. Foley ...	,, 23, 24
Hay P. and A. Association	G. S. Camden ...	,, 30, Oct. 1

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Farmers' Experiment Plots.

WHEAT EXPERIMENTS, SEASON 1912.

H. ROSS, Instructor.

THE past year was the fourth one in which systematic experiments have been carried out by the Department. The season was anything but a favourable one in the Southern, Western, and Northern districts, the rainfall being badly distributed. Notwithstanding these adverse conditions, the yields right through have been satisfactory. Individual acre yields of 47 bushels 50 lb. at Nubba and 40 bushels at Pallamallawa were obtained; and other prominent yields were 36 bushels at Quirindi, 37 bushels 48 lb. at Harden, over 33 bushels at Maryvale, 38 bushels 42 lb. at Germanton, and over 37 bushels at Ginninderra

The average yield of all varieties in 52 fields, representing the whole of the wheat-growing area of the State, was over 20 bushels per acre. When it is taken into consideration that the average yield for the State was only slightly over 10 bushels per annum, a pertinent question to ask is how such large yields are obtained.

The answer is the same as has been given for years—*i.e.*,

FALLOW THE LAND AND WORK THE FALLOW.

Farmers see the benefits accruing from fallowing year after year—they even confess that wheat-growing without a system of fallowing is mostly unprofitable—but when the time comes to get the horses and ploughs into the paddocks, one thing or another is permitted to delay the operation, or, as frequently happens, the good resolution is abandoned altogether.

In the experiment plots a rigorous system of thoroughly fallowing the land, in districts where fallowing is indispensable, is insisted upon by the Inspectors, and the yields obtained, not only during last season, but also in previous years, are a tribute to good methods of cultivation.

While our wheat farmers are content with a 10-bushel yield, there is, perhaps, not much to be said on the subject; but the question is, will our farmers, in view of the increased cost of production, be able to make a 10-bushel crop pay? Personally, I feel sure they will not. A 10-bushel crop, at 3s. 6d. per bushel, is worth £1 15s. per acre. The cost of producing such a crop, on a low scale, is £1 per acre for putting in and taking off. To this must be added 6s. per acre for rent of land, 1s. 9d. per acre for bags, and, say, 1s. 6d. for cartage to the railway station. Depreciation of machinery, &c., must also be allowed, and this will not be less than 2s. 6d. per acre, a total of £1 11s. 9d. for an average return of £1 15s. Under

these conditions wheat-growing is not payable. There is no reason why farmers should not obtain yields on the whole of their cultivation areas similar to those obtained on the experiment plots, but the watchword must be—FALLOW.

Varieties.

Confirming previous experience, Federation again holds pride of place as the best yielder in most districts. It is not claimed that Federation possesses every virtue a wheat should possess; but, as its milling quality is satisfactory, and especially on account of its splendid yielding powers, even under adverse conditions, its advantages distinctly outweigh any disadvantages that may be attributed to it.

Bunyip as an early, and Rymer as a late, variety have upheld their reputations It is unfortunate that the latter variety is not better known to wheat growers, for as a dual-purpose wheat it can be confidently recommended for the Central Tableland, North-western Slopes, Central-western Slopes, South-western Slopes, and Riverina. Such favourites as Marshall's No. 3 and Yandilla King did not show out to the best advantage on account of the late germination experienced during the season.

It was expected that Bayah, which resembles Federation in many respects, would rival this variety as a yielder, but three years' experiments have unquestionably proved that its yielding qualities are not the same as those of Federation.

Warren is a variety that is rapidly coming into favour in the North-western and Western districts, where its average yield was 28 bushels and 18 bushels 51 lb. per acre, respectively.

Manurial Tests.

The question of manuring is of the utmost importance to wheat-growers. It is some years since the use of artificial fertilisers became general in many districts, but a better understanding of these manures and their various actions under different climatic and soil conditions has not followed their more extended use. The need for phosphatic manure in the Western and Southern portions of the State is more apparent than in the Northern and North-western portions. In fact, it appears from the results of continuous experiments that the further south the greater the need for phosphoric acid for wheat-growing. This may be accounted for in two ways—firstly, soils in the North and North-western districts are naturally better supplied with phosphoric acid than those in the Southern wheat-growing area; and, secondly, that the Southern districts have been cropped for wheat for many years past, whereas the Western and North-western districts have only been opened up for wheat-growing during comparatively recent years.

As each load of wheat leaves the farm a quantity of phosphoric acid leaves simultaneously, and as this process goes on it is reasonable to suppose that in districts where wheat cultivation has been practised for a number of years the amount of available phosphoric acid is smaller than in districts where wheat-growing has been carried on for only a few years.

This being so, it is to be expected that the application of phosphatic manures should meet with a more generous response in southern and western than in north-western and northern soils. In this respect the results of the manurial trials bear out this contention. In the North-western district it appears that superphosphate is not so much needed as in the Western and Southern districts, where the average difference between manured and unmanured plots is not less than between 5 and 6 bushels per acre. It is these extra 5 to 6 bushels per acre which mean to the wheat-farmer the difference between success and failure.

The reports of the Inspectors on their respective districts are appended.

SOUTHERN DISTRICT.

H. C. STENING, Assistant Inspector.

THE wheat experiments for 1912 were conducted in twelve different districts in the South. The areas cultivated for the purpose ranged from 10 to 12 acres, divided into plots of ½ acre to 1 acre in area. About six of these were allotted to a trial of varieties of wheat recommended for cultivation by the Department, and four to a manurial experiment. In some districts a plot was sown with a variety selected by the farmers for comparison. The following are the names and addresses of the farmers who undertook to carry out the experiments on their farms:—

Messrs. D. and J. Gagie, "Spy Hill," West Wyalong.
Mr. J. Charles, "Stoneleigh," Grong Grong.
Mr. L. H. Davis, "The Pines," Lockhart.
Mr. B. J. Stocks, "Linden Hills," Cunningham, near Harden.
Messrs. Eulenstein Bros., Henty.
Mr. J. Bowen, Ganmain.
Mr. W. Tait, "Stromness," Ringwood.
Mr. M. J. Carew, "Selbourne," Deniliquin.
Mr. H. E. Barrett, "Burrangong," Young.
Messrs. Hulme Bros., "Burnley," Germanton.
Mr. A. Hannah, "Hillview," Nubba.
Farmers' Union, Gininderra.

The Season.

The 1912 wheat-growing season will long be remembered for its many peculiarities. No rain of any value fell during the first five months of the year, and as the ordinary sowing season passed without the advent of the necessary moisture for germination, the prospects for a good season were anything but bright. However, seeding operations were not hindered, and the sowing of all the plots, with the exception of those at Germanton, was made on a dry seed-bed. The seed in some instances was in the ground for close on eleven weeks before rain came. Only in one district did germination take place, viz., at Henty, where the fallow had been cultivated very frequently. The drought broke on 9th June, resulting in a half-inch to one inch of rain being recorded, and it was a fortnight later when the crops

appeared above ground. During the period of growth the season was most favourable. The mild winter, with an abundance of rain, was most congenial to vigorous growth. The mean average rainfall for the winter months to the end of August is reported to have been 619 points for Riverina, as against a winter average of 478 points, and for the South-west Slopes, 1,022 points as against 609 points. This will give some idea of the bountiful character of the winter rains; in fact, in some instances they exceeded requirements, and crops suffered somewhat from a superabundance of water at the surface, the moisture sinking very slowly into the dry subsoil. Owing to the continued wet condition of the soil during the winter, it was not advisable to harrow the crops, and not until the crops in a number of the districts were too far advanced was the soil in a condition for harrowing; but where practicable the operation was carried out. With the spring another anxious period arrived. Dry conditions set in, and hot winds prevailed, and the crops were not long in showing the effects of a deficiency of moisture, due to the rapid evaporation. Frosts occurred on the 15th and 16th October, just at the time when, in the earlier districts, the ears of the late maturing varieties were emerging from the blade, and under the combined influence of the dry conditions and the late frost, the ears of these varieties were "tipped." The early varieties were well out in ear and escaped, but the late varieties were just at the critical stage, and the ears were too tender to withstand the adverse influences. At Germanton the frost was sufficiently severe to seriously affect the early varieties; the late varieties, not being in ear, were not affected. Good rains fell in November, particularly in Southern Riverina, where some very heavy falls were experienced. These served to fill out the ears, but they arrived rather late to be of real value to the crops in the drier and earlier districts. They were, however, very seasonable for the crops in the later districts, and backed up by serviceable showers in December, assured bumper yields, those obtained at Nubba being exceptionally good. The sample of grain on the whole was excellent.

The following table shows the rainfall recorded during the growing period of the crops at the twelve farms where the experiments were conducted :—

TABLE A.—Showing the Rainfalls.

Month.	Nubba.	Germanton.	Harden.	Gininderra.	Young.	Gammain.	Ringwood.	Wyalong.	Grong Grong.	Deniliquin.	Henty.	Lockhart.
1912.												
April	..	..	..	..	..	..	..	..	..	..	..	..
May	..	..	..	20	..	..	..	..	4	..	1	..
June	228	110	290	377	286	153	241	229	223	187	224	176
July	444	302	544	595	456	307	295	513	259	420	279	291
August	280	209	423	228	541	245	141	236	164	106	134	193
September	187	182	218	261	188	95	214	91	132	159	130	142
October	99	107	134	244	100	58	78	110	92	25	38	188
November	186	264	168	65	173	189	605	55	64	85	307	231
December	..	..	42	31	68	..	..	..	..	..	..	..
Total	1,424	1,174	1,826	1,821	1,812	1,047	1,574	1,234	938	982	1,113	1,221

Cultural Notes.

Wyalong.—Soil, clay loam; ploughed July, 1911; cultivated with spring-tooth cultivator in October, and harrowed in February and March; seed drilled at rate of 50 lb. per acre on 26th and 27th March; early varieties harvested 27th November and 4th December, late varieties on 11th December; ears of late varieties badly "tipped."

Grong Grong.—Soil, red loam; ploughed August, 1911; harrowed immediately after ploughing; cultivated with disc cultivator twice during summer; seed drilled in on 11th and 12th April at rate of 50 lb. per acre; crop harrowed in July, 1912; harvested 4th and 5th December; ears of late varieties badly "tipped."

Lockhart.—Soil, red clay loam; ploughed July, 1911; cultivated with disc cultivator in March; drilled 15th and 16th April, at 50 lb. per acre; early varieties harvested 6th December, late varieties 27th December; ears of late varieties badly "tipped."

Harden.—Soil, sandy loam, new land; ploughed July, 1911; harrowed August; cultivated with Martin Stump-jump cultivator early in September; harrowed late in September; drilled 2nd and 3rd May, at rate of 45 lb. per acre; crop harrowed August; harvested early varieties 10th December, late varieties 18th and 21st December; seed was attacked by wire-worms in the soil, consequently decreased germination.

Henty —Soil, clay loam; ploughed September, 1911; cultivated seven times during the summer; drilled 23rd and 24th April, at rate of 50 lb. per acre; crop harrowed 27th September; harvested 9th, 12th, and 24th December; seed germinated before the rain, and as there was insufficient moisture to supply the needs of the young plants, they withered; the subsequent germination was not very satisfactory.

Ganmain —Soil, red clay loam; ploughed August; harrowed after ploughing, and again in November; cultivated with spring-tooth cultivator in April; harrowed before drilling; seed drilled 18th and 19th April, at rate of 50 lb. per acre; harvested early varieties on 28th November, and late varieties on 7th and 9th December; ears of late varieties "tipped."

Ringwood.—Soil, red chocolate loam, new land; ploughed in August; harrowed twice; cultivated with disc cultivator in May; seed drilled 15th May, at rate of 50 lb. per acre; crop harrowed in August; harvested 17th and 18th December; ears of later varieties were "tipped"; patches of "take-all" were present in crops.

Deniliquin.—Soil, clay loam to light clay, new land; previously wind-swept, poor carrying country; ploughed August; seed drilled 29th and 30th April, at rate of 50 lb. per acre; crop rolled and harrowed; ears of late varieties badly tipped; no rain of any value fell on the fallow.

Young.—Soil, sandy loam; fallowed; seed sown 24th and 25th May; harvested 27th and 28th December; the plot was situated on low ground, and with the abundant rainfall proved too wet and cold; germination was not satisfactory.

Germanton.—Soil, rich loam, new land; ploughed May; rolled with spiked roller; harrowed prior to drilling; drilled 17th and 18th June, at rate of 50 lb. per acre; harvested 27th December. Early varieties were affected by frost, which occurred 15th and 16th October.

Nubba.—Soil, red clay loam; ploughed early May; rolled and cultivated with spring-tooth cultivator prior to drilling; drilled 29th May, at rate of 50 lb. per acre; "take-all" patches were present in the crops.

Gininderra.—Soil, sandy loam; ploughed May; rolled; drilled 22nd and 23rd May, at rate of 50 lb. per acre; harvested 25th January, 1913; crops were ready to harvest a month earlier.

TABLE B.—Showing Results of Variety Trials, 1912—Yields per acre.

Seed—45-50 lb. per acre. Manure—56 lb. superphosphate per acre.

Name of Experimenter.	Federation.	Yandilla King.	Marshall's No. 3.	Bayah.	Cleveland.	Rymer.	Florence.	Bunyip.	Firbank.	Comeback.	Warren.	Bobs.
	bus. lb.	bus. lb	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb	bus. lb.	bus. lb.
A. Hannah, Nubba	47 50	42 58	40 28	..	36 29	33 48	30 2	..	..	..	..	..
Hulme Bros., Germanton ..	34 1	38 42	..	..	40 5	35 32	..	..	..	24 49	..	26 50
B. J. Stocks, Harden	37 48	32 2	..	..	30 2	..	29 12	28 6	..	..	..	..
Farmers' Union, Gininderra ..	34 10	37 22	..	21 38	30 2	..	15 26	..	..	..	..	..
H. E. Barrett, Young	24 18	24 29	27 8	..	19 4	23 54	..	20 52	..	17 6	..	..
J. Bowen, Ganmain	26 2	21 40	18 41	22 52	..	..	..	..	..	21 12	23 5	..
W. Tait, Ringwood	29 30	18 56	20 16	22 33	..	..	20 2	..	..	19 30	18 8	..
J. Charles, Grong Grong ..	24 32	15 44	15 17	20 6	..	..	..	19 23.	..	17 29	..	..
D. and J. Gugie, Wyalong ..	25 45	14 9	14 36	18 41	..	..	21 53	..	19 46	16 17	..	..
M. J. Carew, Deniliquin ..	16 58	14 21	..	..	..	15 22	..	..	..	16 38	17 22	14 21
Eulenstein Bros., Henty ..	17 16	15 20	16 22	..	12 54	..	..	..	..	13 2	..	11 26
T. H. Davis, Lockhart.. ..	16 46	11 15	..	13 38	..	..	11 58	..	13 4	..	10 40	..

Comparison of Varieties.

It would be of great interest to know what are the average comparative yields of the different varieties used in these trials in the southern districts; but since the same varieties are not sown in all the districts, it is obvious that it would be inaccurate to compare the actual averages of the yields of each variety. One variety may have been sown in proportionately more of the well favoured districts, giving a larger average, and yet comparatively not as good yields. As an example, the average of the yields of Cleveland in the six districts where it was sown is 28 bushels 6 lb.; whereas the average of Federation, which was sown in the whole twelve districts, is 27 bushels 54 lb. It cannot be said that Cleveland yielded better than Federation, for if we take the average of the yields of Federation in the districts where Cleveland was sown, we find it to be 32 bushels 33 lb.

In order to compare the yields of the varieties with any degree of accuracy, it will be necessary to average the percentage yields of each variety in each district, taking Federation as the standard of 100, as in Table C.

TABLE C.—Showing Percentage Yields of Varieties.

District.	Federation.	Yandilla King.	Marshall's No. 3.	Bayah.	Cleveland.	Rymer.	Florence.	Bunyip.	Firbank.	Comeback.	Warren.	Bobs.
Nubba	100	89·9	81·5	.	76·2	70·6	62·7	..	..	.	..	..
Germanton	100	113·7	..	..	117·8	104·4	..	..	..	72·9	..	78·8
Harden	100	84·7	..	..	79·4	..	77·2	74·3	..	..	..	..
Gininderra	100	109·3	.	63·3	87·9	..	45·1	..	..	..	..	..
Young	100	100·7	111·6	..	78·4	98·3	..	85·8	.	70·3	..	..
Ganmain	100	83·2	71·7	87·4	..	..	..	..	..	81·4	88·6	..
Ringwood	100	64·1	68·6	76·4	..	..	67·9	..	..	66·1	61·4	..
Grong Grong .. .	100	64·1	62·3	82·	..	..	..	79·	..	71·2	..	..
Wyalong .. .	100	55·	56·7	72·5	..	..	85·	..	76·7	64·4	..	.
Deniliquin	100	84·6	..	..	.	90·5	..	..	..	98·	102·3	84·6
Henty	100	88·8	94·8	..	74·7	..	..	..	..	75·5	..	66·2
Lockhart	100	67·1	..	81·3	..	..	71·3	..	77·9	..	64·5	..
Average .. .	100	83·76	78·17	77·15	85·73	90·95	68·2	79·7	77·3	74·97	79·2	76·53

Federation sown in every district, averaged 27 bushels 54 lb., and taking 100 as to equal 27 bushels 54 lb., we are able to arrive at the comparative average yields.

TABLE D.—Comparative Average Yields of Varieties.

	bus.	lb.		bus.	lb.
Federation ...	27	54	Marshall's No. 3 ...	21	48
Rymer	25	22	Firbank	21	33
Cleveland... ...	23	54	Bayah	21	31
Yandilla King ...	23	22	Bobs	21	21
Bunyip	22	13	Comeback ...	20	54
Warren	22	5	Florence	19	1

Details of Varieties.

Federation.—These results can only be regarded as another victory for Federation. An average of 27 bushels 54 lb. throughout all districts, and the individual yield of 47 bushels 50 lb. at Nubba are remarkable, and show that the variety is upholding its reputation. Its consistency as a yielder under all conditions is demonstrated by the fact that this is the fourth year in succession that it has headed the list.

Rymer.—This is also the fourth consecutive year in which Rymer has been runner-up to Federation, and the wonder is that it is not grown more extensively. It also yields a heavy crop of hay, and is thus a splendid dual-purpose wheat.

Yandilla King, Marshall's No. 3, and Cleveland are all late maturing wheats, and, for best results, require an early germination. The past season, therefore, cannot be regarded as too favourable for them, particularly in the early districts. In these districts the yields of the two first-mentioned were considerably reduced, owing to the "tipping" of the ears. In spite of this circumstance, their average comparative yields are satisfactory. The three are good, all-round wheats.

Yandilla King bids fair to become our best dual-purpose wheat. In yield it surpassed Federation in three of the later districts. It produces a good crop of hay, and holds its grain well, and the straw is strong, and stands up well—therefore it is storm-resistant. The danger with the majority of dual-purpose wheats is that when a good crop is produced, there is a tendency to lodge.

Cleveland has been a consistently good yielder on the Southern Tableland, and this year its suitability for the cooler portions of the South-western Slopes has been proved. It yielded best of all varieties tried at Germanton, with a yield of 40 bushels 5 lb. It also is a good hay wheat.

Warren is apparently an excellent drought resister. It came into ear about the same time as Yandilla King and Marshall's No. 3, and yet did not suffer from ear-tipping. At Deniliquin, where less than 10 inches of rain fell during the growing period, it yielded better than Federation. It, however, has a weak straw, and is liable to lodge. It would, therefore, be unwise to sow this variety in large areas.

Bayah is not as prolific as, and apparently does not possess any other qualities superior to, Federation.

Bobs has not proved itself very suitable for the South.

Of the early varieties, *Bunyip* gave the best average comparative yield, and *Firbank*, generally regarded purely as a hay wheat, proved that it is not an indifferent grain producer. These two varieties suit our dry districts very well.

The results from *Comeback* were rather disappointing. As it made a vigorous early growth, and the season was apparently favourable to it, higher yields were anticipated.

The yields harvested from *Florence* do not give a true indication of its capacity as a grain producer. In a couple of instances the crops were ready for the harvester some time before they were stripped, and as Florence does not hold its grain well a considerable quantity of grain was shed. On account of this propensity it is not advisable to sow this variety extensively, as it should be harvested as soon as it ripens.

TABLE E.—Showing Yields of Farmers' Varieties compared with Federation.

District.	Departmental Variety.	Yield per acre.	Farmers' Variety.	Yield per acre.
		bus. lb.		bus. lb.
Harden	Federation ...	37 48	Lotz	34 8
Ringwood	,, ..	29 30	College Purple	22 49
Ganmain	,, ...	26 2	Turvey's Experimental ..	23 22
Grong Grong ...	,, ...	24 32	Improved Steinwedel ...	24 29
Deniliquin	,, ...	16 58	Dart's Imperial	8 10
Lockhart	,, ...	16 46	Farmers' Friend	11 48

The varieties chosen by the farmers are all of the Purple Straw type, and although they have been defeated they are by no means disgraced, for, in addition to returning good yields of grain, they produced good crops of hay,

and are thus good dual-purpose wheats. The germination of Dart's Imperial at Deniliquin was unsatisfactory. These varieties are not included among those recommended by the Department, on account of their uniformly low milling quality.

Manurial Experiment.

In all districts a manure test with varying quantities of superphosphate was conducted. Plots were sown with Federation in the warmer districts, and with Cleveland in the cooler districts, and superphosphate was applied at the rate of 28 lb., 56 lb , and 84 lb. respectively. A plot was also sown on unmanured land for comparative purposes.

TABLE F.—Showing Results of Manurial Experiment.

District.	No Manure.	Manured with Superphosphate at rate of 28 lb. per acre.	Manured with Superphosphate at rate of 56 lb. per acre.	Manured with Superphosphate at r te of 84 lb. per acre.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Nubba	31 48	34 18	36 29	37 54
Germanton .. .	28 49	31 49	40 5	36 18
Harden	26 45	29 57	30 2	31 22
Gininderra	25 24	28 16	30 2	30 34
Young	14 41	20 13	19 4	20 48
Ganmain	18 10	19 38	26 2	27 46
Ringwood	25 30	26 48	29 30	27 22
Grong Grong .. .	22 15	24 17	24 32	26 0
Wyalong .. .	19 33	23 20	25 45	26 16
Deniliquin .. .	18 17	21 52	16 58	19 13
Henty	5 50	10 0	12 54	15 40
Lockhart	9 25	15 16	16 46	16 43
Average	20 32	23 48	25 40	26 19

From these results it will be seen that even the small application of 28 lb. of superphosphate per acre has resulted in an appreciable increase in yield in every district.

It is frequently remarked by farmers that new fallowed land will not respond to an application of superphosphate. The results at Germanton and Ringwood, where the experiments were carried out on new land, should serve to controvert this opinion, an application of 56 lb. per acre returning increased yields of 11 bushels and 4 bushels respectively. New land, however, should not receive a heavier dressing than 56 lb., which may be considered safe to adopt as a general standard. Increased yields are frequently obtained from a larger application in the more favoured districts, but in the drier districts the additional fertiliser stimulates the production of too much flag, and the plants are less able to withstand dry conditions, and "burn off" more readily.

General Remarks.

In the early districts, where the late spring rains were too tardy to be of any appreciable benefit to crops, the advantage of conserving moisture in the soil by means of fallowing was amply proved by increased yields. At

Grong Grong, where the rainfall for the growing period was only 938 points, the Federation plot on fallowed land yielded 21½ bushels; whereas the same variety sown on unfallowed land in the same paddock under conditions otherwise precisely similar, was badly blighted by the hot dry winds in spring, and yielded only 10 bushels, or 14½ bushels less than the yield on fallowed land, and this in a year when, owing to the deficiency in the rainfall during the fallowing season, very little moisture was available for conservation in the fallow.

In the later districts, however, there were instances where unfallowed land returned yields equal to those from fallowed land, owing to the exceptionally favourable season for such districts; but farmers should be warned that if they depend upon a recurrence of such seasons they will find that they are leaning on a very weak reed, and if they persist in the practice of continuous cropping, it will only lead to decreased yields and disappointment.

Another of the benefits of fallowing was demonstrated by the fact that it was possible to proceed with the sowing and await the advent of rain, while those farmers who did not have their land fallowed were unable to get it into condition for sowing until the latter part of June, and, consequently, sowing was two or three months later than is normal. In an ordinary season little hope could have been held out for crops sown so late; but, fortunately for these farmers, the propitious season assured them good returns in many cases. But they must remember that one swallow does not make a summer, and such late sowing is a very risky gamble with the elements. It would be wise for them to take a lesson from the past season, and in future to have their land fallowed, so that it will always be in a condition for sowing when desired.

The effectiveness of the spring-tooth cultivator as an implement for preparing an ideal seed-bed was demonstrated at Nubba, where, in order to reduce the large clods, it was found necessary to use the roller, after which the land was cultivated with the spring-tooth cultivator. This had the effect of drawing the clods to the surface and allowing the fine soil to fall through to the bottom, thus providing the finely pulverised subsurface so essential for a good seed-bed, and at the same time a cloddy mulch, which has a greater receptive capacity for rain, and which remains longer effective than a mulch composed of fine soil.

Federation on land cultivated in this manner yielded 47 bushels 50 lb., whilst the same variety on similar land adjacent to the plots averaged 33 bushels per acre.

All the seed-wheat used in the experiments was pickled for the prevention of bunt with a 2 per cent. solution of bluestone and then immersed in a solution of 1 per cent. lime. As the yields will show, the germination was not seriously affected, thus proving the fallacy of the theory held by many farmers—that if pickled seed is sown in a dry seed-bed and remains ungerminated for some time, it will be destroyed. So long as the seed is perfectly dry before sowing there is no danger. It is also the opinion of

many that bunt will not result in a crop from untreated seed sown on a dry seed-bed. For these two reasons a considerable quantity of seed was sown untreated, and, consequently, there are many reports of smutty wheat. Be on the safe side and, whatever the conditions, pickle your seed-wheat carefully before sowing ; the extra labour is a mere bagatelle compared with the loss occasioned by a smutted crop.

Experiments with Oats.

Experiments with varieties of oats were conducted in the following districts, the names of the experimenters being :—

Albury	... ...	Mr. G. Laidlaw, "Elm Park," Jindera..
Harden	... ...	Mr. B. J. Stocks, "Linden Hills," Cunningham.
Henty	... ...	Messrs. Eulenstein Bros., Henty.
Gininderra	...	Farmers' Union, Gininderra.

Unfortunately, the crops at Albury "lodged," owing to heavy rains in November, and they, consequently, had to be cut for hay. Some of the varieties were also badly attacked by caterpillars. Under these conditions a fair comparison even of the hay yields could not be made.

Arrangements could not be made for the harvesting of the oat plots at Gininderra when ready, and, consequently, the crops there also "lodged" and shed their grain, and much loss was also occasioned by the depredations of birds.

TABLE G.—Showing Yields of Varieties of Oats tried at Harden and Henty.

District.	Algerian.	Red Rust-proof.	Bathurst Early.	Abundance.	Potato.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Harden	38 5	38 1	24 13	23 32	21 13
Henty	23 26	24 24	20 37	20 13	18 26
Average .	30 45	31 12	22 25	21 52	19 49

Of these varieties Algerian and Red Rust-proof are apparently the varieties best suited for grain production in the South. The Red Rust-proof is not such a good quality oat as Algerian.

NORTH-WESTERN DISTRICT.

A. H. E. McDONALD, Inspector.

THE 1912 wheat season will long be remembered by farmers as one of the most disastrous and remarkable recorded in the North-west. Portions of the district, and these fortunately contained a large proportion of the wheat

area, were well favoured, and gave good yields, notably Tamworth and Inverell, two very large producing centres ; but practically all the country between Werris Creek and Narrabri, including also Manilla, suffered severely.

The season was remarkable, inasmuch as at one period the crops promised exceedingly well, and enormous yields were anticipated—anticipations, alas, that were to be blasted. A long dry period was brought to a close by bounteous mild rain in June. This rain, and all that followed during June and July, was of an exceptional character. Being chiefly monsoonal from the warm north, it was very mild, and the temperatures generally remained high. . This induced a very rapid, rank, almost hothouse growth. The wheat was not checked by frosty mornings or cold nights, and, owing to the lateness of the season when growth commenced, few cared to check the crops by feeding off.

Towards the end of August a dry period again set in, and was marked by continuous dry westerly winds of high velocity. These continued day after day, until at last the soft plants could withstand them no longer, and withered away. Some plants endeavoured to form heads, but they were nipped and killed by the severe winds. In October heavy rain fell again, but it came too late, and most farmers gathered a wretchedly poor crop. Owing to the exceptional severity of the weather at the critical time, even crops on comparatively well-worked land suffered considerably.

The lateness of the seasons at Tamworth and at Inverell permitted the wheat to take advantage of the October rain, and good crops were gathered.

Influence of Soil.

One of the chief factors in determining the yield was the character of the soil As shown by the foregoing, the wheat suffered through being too soft and tender. Wherever the land was strong and rich, and conducive to soft, rank growth, the wheat suffered severely. Hard red soil and the poorer sandy soils produced the best yields. They did not force the crops too much in the early stages, and produced hardy, strong plants which were able to withstand drought.

What Fallowing is and is not.

The season has again strongly emphasised the necessity for fallowing. In almost every case where this system was followed faithfully, very fair yields were obtained. A great many complaints are being uttered regarding the failure of fallow during the past season, but when the question is faced and discussed without prejudice, it is found that the condemnation has nothing whatever to rest upon. As a matter of fact, those who are condemning it have not tested it thoroughly. The treatment of the land which is called fallowing, and which is condemned on the results of last season, is found to be the ploughing of the ground in early autumn and its reploughing before

sowing. This is not fallowing. Others have been heard to describe as fallowed land that which had borne a crop the previous year, but which crop was a failure.

The first class of fallowing (so called) is useless because shallow working of the land is not included. It was especially useless last season because, owing to the dry, late summer and autumn, no rain fell on the ploughed ground. Fallowing is useless if no rain falls on the fallowed ground, or if the land is not worked continually and systematically with shallow cultivators.

It will be noticed that the results at Curlewis are poor. This experiment was divided into two parts. One was ploughed early and fallowed, while another was ploughed late as is the ordinary practice. The crop on the fallowed land was fair while the other was poor, but unfortunately the men made a mistake and harvested the two as one.

The practice of fallowing has been, until recently, practically unknown in the North-west. There are indications that farmers are realising the value of the system, and are attempting to follow it. It is through neglect in this respect that yields have been so low of late years. By fallowing, many of the failures can be avoided. Last season was certainly of such a character that the benefits of fallowing were not so noticeable as in previous seasons. Practically no rain fell from December, 1911, till June, 1912, and the short summer fallow which is generally so successful in the North-west was comparatively ineffective. This should not lead farmers to condemn this useful practice.

A Practicable System.

It is only by the adoption of a proper system of fallowing that satisfactory returns from year to year can be looked for in the North-west. Continual cropping has reduced the humus of the soil, and it does not naturally retain moisture as it did when first cultivated, and the returns which were often then taken from roughly cultivated land cannot now be expected. Besides this, the wheat is jostled and crowded by wild oats, thistles, &c., and the yield is very considerably reduced by the presence of these pests alone. Owing to the large annual rainfall and the fertility of the land, a modified system of fallowing is permissible. A system of full fallow on half the wheat land and short summer fallow on the other half is recommended. According to this method, the man who has 300 acres to crop would grow 200 acres of wheat each year. One hundred acres would be ploughed in the spring, and as soon as the wheat crop was taken off another 100 acres would be ploughed. This would give the 200 acres for cropping. Through late summer and autumn the cultivators or harrows should be kept going on the ploughed land to keep down weeds and to conserve moisture. Such a system gives ample time to get all the ploughing done, allows all the land to reap the benefit of summer rains, and at the same time it enables the land to be kept free from wild oats, &c.

Variety Trials.

TABLE I.—Showing the Returns from the Grain Plots.

	W. Tonkin, Delungra.	A. J. Blunt, Pallamallawa.	S. Forge, Tamworth.	E. Currell, Barraba.	J. Marshall, Quirindi.	G. F. Young, Curlewis.	J. H. McDonald, Gunnedah.
Rainfall during growing period.	12·93	10·87	11·71	8·93	11·06	10·22	10·99
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.
Bunyip	26 0	.....	.....	24 27	.....	.....	16 40
Marshall's No. 3 ...	28 46	24 40	22 0	33 22	33 22	4 44	.. ...
Rymer	32 34	.....	24 0	31 0	36 34	6 20	15 0
Warren...	27 0	.....	20 45	31 51	33 16	.....	.....
Yandilla King... ...	.....	26 10	22 30	... ..	.....	4 45	1 0
Federation	36 45	28 19	18 0	40 0	26 48	7 20	14 0
Bayah	22 40	.....	15 30	... ..	20 42	6 27	14 20
Comeback	.....	24 8	.....	23 13	19 12	.....	14 0
Cleveland	23 37	.....	.....	28 9	26 50	.....	.....
Florence	26 22	.....	.....	.....	.....	.....	.....
Cedar	.....	.....	17 30	.....	.....	.....	.....
Average	27 58	25 49	20 2	30 17	28 6	5 55	14 48

Trial of Algerian Oats.

Algerian oats	.. ...	7 17	29 30	.....	.....	.....	15 0

The variety which stood out most prominently for general excellence was Rymer. As a grain yielder it headed the list, with Federation and Yandilla King occupying second place. Marshall's No. 3 also yielded well. Cleveland did well in the cooler districts. Unfortunately, at Delungra it was greatly damaged by a hailstorm.

Speaking generally, the later varieties such as Rymer and Marshall's No. 3 give the best yields in the North-west. September is a dry month on the average, while October is more favoured. The earlier wheats are coming into ear in September, and if dry conditions prevail, they are badly "tipped." Further, later varieties are benefited by rain, which falls either in September or October, and thus have a better chance. It has frequently happened that rain has come in time to save late varieties when it has been too late for early sorts.

The Influence of Fertilisers.

The application of fertilisers to the soil in the North-west in the past has not always resulted in the pronounced differences which indicate that the soil is in need of such assistance. During the past season, however, the yields from plots treated with fertilisers show that the fertiliser exerts some

influence upon the crop. From every plot to which fertiliser was applied an increase was obtained, with one exception. In most instances the increase amply repaid the cost of the fertiliser.

Generally speaking, the soils are rich enough, as indicated by the unmanured plots, to produce very good yields without fertilisers; but if it can be shown that the yield can be improved by even 2 bushels, the application of fertilisers will be justified. Fertilisers will probably only be found effective when used in conjunction with a system of fallowing.

TABLE II.—Showing the Results obtained from Fertilisers.

Variety—Federation.

	Delungra.		Pallamallawa.		Tamworth.		Quirindi.	
	Yield per acre.	Difference Increase.	Yield per acre.	Difference Increase.	Yield per acre.	Difference Increase.	Yield per acre.	Difference Increase.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb	bus. lb.	bus. lb.	bus. lb.
No manure	36 45	...	28 19	...	18 0	...	26 48	...
28 lb. Superphosphate.	...	...	30 10	1 51	19 0	1 0	25 18	*1 30
56 lb. ,, ...	39 40	2 55	33 0	4 41	18 45	0 45	34 12	7 24
84 lb. ,, ...	40 5	3 20	30 23	2 4	19 0	1 0	28 52	2 4

*Decrease.

TABLE III.—Showing Results of Experiments with Wheat and Oats for Hay.

TENTERFIELD.			INVERELL.		
Variety.	Manure per acre.	Yield.	Variety.	Manure.	Yield.
		t. c. q.			ton cwt.
Comeback ...	No manure ...	1 6 3	Comeback ...	No manure	1 16
,, ...	1½ cwt. superphosphate.	1 6 0	Cleveland ...	,, ..	1 14
,, ..	1¼ ,, complete manure.	1 11 2	Rymer ...	,, ..	2 8
Haynes' Blue stem.	1¼ ,, ,, ,, ..	1 7 0	Warren ..	,, ...	2 3
Jonathan ..	1¼ ,, ,, ,, ..	1 1 2	Yandilla King	,, ..	1 14
Cleveland ...	1¼ ,, ,, ,, .	1 4 1	Zealand ...	,, ...	2 0
Huguenot ...	1¼ ,, ,, ,, ..	0 18 0			
Algerian oats . .	No manure ...	0 16 3			
,, .	1¼ cwt. complete manure.	1 0 1			
White Tartarian..	1¼ ,, ,, ,, ..	1 10 1			
Bathurst Early ..	1¼ ,, ,, ,, ..	1 10 1			

The complete manure used at Tenterfield consisted of 14 parts superphosphate, 4 parts sulphate of ammonia, 1 part sulphate of potash.

WESTERN DISTRICT.

[illegible] Agricultural Inspector.

[illegible] practically by securing a payable crop [illegible] demonstrated by the results of the experiment [illegible] Western district last season. Generally speaking, an [illegible] experienced, but, in spite of this, very satisfactory [illegible] obtained.

Trials were established in the following localities:—

[illegible]	Jas. Bell & Co.
[illegible]	D. Cameron.
[illegible]	W. Gray.
[illegible]	A. J. Reymond.
[illegible]	J. Roach.
[illegible]	A. Croft.
[illegible]	Towri Estate.
[illegible]	T. Bragg.
[illegible]	A. Crouch.
[illegible]	D. Cannon.

The [illegible] yields are given in the table on the opposite page.

Half acre plots were sown in each case, with the exception of the Towri Estate, Marsvale, where each plot was 1 acre in extent. The plots were [illegible] varying dates during April and May. No germination, however, took place until the breaking of the dry period early in June. The late maturing wheats, viz., those which give the best results from an early sowing, were thus placed at a disadvantage.

The following were the average yields:—

	Yield per Acre. bus	lb.	No. of Trials.
Federation	20	45	10
Warren	19	46	6
Rymer	19	29	6
Bunyip	19	28	8
Bayah	17	48	10
Yandilla King	17	0	9
Cleveland	14	31	7
Florence	14	26	3
Marshall's No. 3	14	0	4
Bobs	13	8	3
Comeback	12	47	4

Federation again proved its superiority as a grain yielder, especially in a comparatively dry season, by coming easily first, beating all other varieties by a bushel per acre. Warren, Rymer, and Bunyip all yielded consistently, with an average of over 19 bushels per acre. Bayah and Florence were disappointing, while Yandilla King, Marshall's No. 3, and Cleveland were placed at a disadvantage by the late germination.

TABLE showing Results of Farmers' Experiment Plots in the Western District.

	Towri Estate, Maryvale.	D. Cameron, Coonabarabran.	W. Gray, Cookamidgera.	J. Bell & Co., Bothfields.	A. J. Raymond, Forbes.	J. Roach, Gilgandra.	A. Crouch, Peak Hill.	D. Cannon, Tullamore.	T. Bragg, Mungeribar.	A. Croft, Gulgong.
	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb.	bus. lb
Yandilla King, superphosphate 56 lb. per acre ..	28 0	13 46	17 13	.....	23 19	20 44	14 18	13 40	8 12	14 55
Cleveland ,, ,, ...	19 50	.....	15 20	.....	20 44	17 0	20 4	.....	4 10	4 58
Bayah ,, ,, ..	26 55	15 58	16 48	18 11	24 25	19 46	23 20	13 6	8 47	10 59
Rymer ,, ,, ...	24 29	.. ...	.....	12 43	20 48	20 44	24 53	.. . .	.....	13 20
Warren ,, ,, ...	25 13	.....	.....	18 37	24 32	16 2	25 38	.....	.....	8 37
Bunyip ,, ,, ...	25 18	18 0	15 44	22 55	29 33	16 32	.....	12 26	15 15	.....
Florence ,, ,, ...	.....	16 8	.....	.....	... ..	.....	.....	12 30	.....	14 41
Comeback ,, ,, ...	.....	14 8	12 55	.....	.....	.....	.....	13 34	10 42	.....
Bobs ,, ,, ...	.....	14 46	.....	14 26	.....	.. ...	.....	10 12	.....	.....
Marshall's No. 3 ,, ,, ...	.....	.....	14 48	.....	... ..	.....	22 31	. ....	7 1	11 42
Federation ,, ,, ,, ...	33 35	20 46	17 18	20 27	31 22	19 36	25 11	15 8	11 14	10 0
,, ,, ,, 84 ,, ...	34 42	19 38	22 13	22 2	30 15	22 36	25 11	20 36	9 18	7 14
,, ,, ,, 28 ,, ...	33 43	18 46	13 13	22 11	27 44	21 12	26 44	.....	10 16	8 22
No manure	29 17	19 28	8 51	15 51	27 33	17 44	20 31	11 12	10 41	5 2

The Manurial Trials.

The manurial trials were in each case carried out with Federation, this being taken as the standard variety.

The following average yields were obtained :—

			bus.	lb.
Superphosphate,	84 lb. per acre	... ...	21	25
„	56 „ „	... ...	20	45
„	28 „ „	... ...	20	14
No manure ...	... ...	... ...	16	49

The superiority of the heaviest dressing of superphosphate was most plainly shown in cases where the paddocks had been under cultivation for a considerable time.

The application of the lightest dressing, viz., 28 lb. per acre, gave an increased yield of practically 3½ bushels over the unmanured portion. This dressing, which cost approximately 1s. 6d. per acre, yielded a gross profit of 11s. 8d. per acre, or a net profit of fully 10s. per acre.

It is noteworthy that this benefit from superphosphate was obtained in a season which was abnormally dry.

The need for systematic phosphatic manuring has been thus amply demonstrated again. The theory frequently advanced by farmers, that manuring in a dry season is not only not beneficial, but indeed harmful, cannot hold good in view of the results of these experiments. Manuring for wheat-growing pays in the Western district, whether the season is a dry or a wet one. While in some cases, notably at Cookamidgera and Tullamore, 84 lb. of superphosphate per acre gave considerably increased yields over 56 lb. per acre, it must not be taken for granted that such would be the case in all districts, and farmers are advised to continue sowing 40 to 56 lb. of superphosphate per acre in cases where the land has been cropped for only a limited period ; 84 lb. per acre may be applied to paddocks which have been under cultivation for a considerable number of years.

While the addition of these quantities of superphosphate has materially helped to increase the yield, the success of the plots is mainly due to the fact that the land had been thoroughly fallowed. This, combined with judicious seeding of the varieties of wheat suited for the various districts, resulted in these very payable yields.

NORTH COAST WINTER GREEN FODDER EXPERIMENTS, 1912.

G. MARKS, Inspector of Agriculture.

ARRANGEMENTS were originally made for planting the experiments on the farms owned by the following gentlemen :—

Mr. A. McM. Singleton, Tinonee, Manning River.
Mr. H. B. Faviell, Bonville.
Messrs. McDonald and Hynes, Glenugie, *viâ* Grafton.
Mr. E. C. Cory, Gordon Brook.
Mr. A. Burnett, Rappville.

Unfortunately, the weather conditions seriously affected the whole of the North Coast during last autumn and winter months. In several localities it was the driest known for the past twenty-two years, and, needless to say, stock suffered and dairymen lost heavily. Through the drought that prevailed it was impossible to get land prepared in time. It is useless attempting the planting of seed in the coast unless there are favourable conditions, particularly as regards moisture, and the sowings on the three last-named farms had to be abandoned. Local dairymen who were accustomed to plant their areas for winter needs were also unable to get their land ready for sowing, and even with a few who were fortunate enough to get their plantings done, the crops made very little growth.

Results at Tinonee.

The Manning district was a little more fortunate as regards rain than most of the others, and the plots there were planted under more favourable conditions. The excellent returns obtained there should be an incentive to others to make provision for winter needs, and the wheats under trial gave unmistakable evidence of their superiority over oats for both quantity of fodder and earliness. Furthermore, the wheats were free from rust, whereas the oats were badly affected. Giant rye proved an absolute failure. It germinated well, but maintained a stunted growth all through. Of the peas and vetches grown in combination with wheat and oats, the peas gave the better results. They are much earlier than the vetches, and accordingly are in a better condition for feeding at the time the wheat or oats are cut.

The rainfall covering the period that the crop occupied the ground was 8·18 inches. The excellent returns obtained are in no small measure due to the fact that the soil was deeply ploughed and thoroughly worked immediately the previous crop of green maize was removed, thereby enabling it to absorb and retain the maximum amount of moisture.

Thew can be confidently recommended as an early wheat for all but extremely wet districts. It makes splendid hay.

Huguenot is recommended where peas or vetches are sown in combination. It is a shy stooler, but is a strong growing variety, and is well able to support a heavy leguminous growth.

The peas and vetches grow better with wheat than they do with oats, and they are also better supported. Tests were made in the feeding of fodder from the various plots as regards palatability, but all were relished alike, and there were no visible signs of stock favouring any particular variety or mixture.

TABLE I.—Showing Results of Experiments at Tinonee.

Variety.	Fertiliser per acre.	Yield.			
		tons	cwt.	qrs.	lb.
Medeah	No manure	15	18	3	19
Thew	,,	14	13	2	15
Huguenot	,,	17	2	1	0
Huguenot and Grey Field Peas	2 cwt. superphosphate	16	8	2	16
Huguenot and Grey Field Peas	No manure	14	17	2	3
Huguenot and Black Vetches	2 cwt. superphosphate	12	14	2	27
Huguenot and Golden Vetches	,, ,,	11	5	2	8
Algerian Oats	No manure	9	3	3	2
Algerian and Grey Field Peas	2 cwt. superphosphate	13	4	1	24
Algerian and Grey Field Peas	No manure	12	1	0	15
Algerian and Black Vetches	2 cwt. superphosphate	13	2	2	3
Algerian and Golden Vetches	,, ,,	11	17	0	27
Black Winter Rye	No manure	9	19	1	8
Giant Rye	,,	Failed.			

The seed in all cases was sown at the rate of 2 bushels per acre, and where manure was applied it was at the rate of 2 cwt. of superphosphate per acre. The increased yield due to the use of superphosphate at Tinonee was over 1 ton per acre.

Results at Bonville.

At Bonville it was impossible to plant until late in the season. Twelve inches of rain fell within the first fortnight after sowing, and did much harm to the mechanical texture of the soil. As only 2 inches fell afterwards, and there were visitations of hot, dry, westerly winds, the whole of the plots suffered. The oats did not make sufficient growth to enable weights to be taken, and were accordingly fed off. As on the Manning, Giant rye again proved a failure, whilst its neighbour, Black rye, gave very fair returns in response to the fertiliser. The wheats again showed out prominently over the oats, and, though the yields were light, they still indicate that the former give infinitely better results in coastal districts than oats.

TABLE II.—Showing Results of Experiment at Bonville.

Variety.	Yield.			
	tons.	cwt.	qrs.	lb.
Thew	0	19	1	14
Medeah	0	15	2	6
Huguenot	1	11	1	15
Huguenot and Grey Field Peas, no manure	0	18	1	25
Huguenot and Grey Field Peas, 2 cwt. superphosphate per acre ..	0	18	1	25
Huguenot and Black Vetches, no manure	1	6	1	0
Huguenot and Golden Vetches, 2 cwt. superphosphate per acre ...	1	11	0	12

TABLE III.—Showing Results of Fertiliser Test.

Variety.	No Manure.				Bonedust, 2 cwt. per acre.			
	ton	cwt.	qrs.	lb.	tons	cwt.	qrs.	lb.
Medeah...	0	19	1	14	1	15	3	25
Thew	0	15	2	6	1	3	1	9
Huguenot	1	1	1	15	1	8	0	22
Black Rye	1	9	3	18	2	7	3	13

The above figures are interesting, in that they show that in every case the addition of a quantity of phosphatic fertiliser resulted in a considerably increased yield, which in some plots reached as high as 50 per cent.

The lesson to be learned from these and previous experiments is that in average seasons it pays the North Coast farmer handsomely to cultivate winter fodders. Some years ago suitable varieties of wheat were practically unknown, but now, with the advent of such eminently suitable varieties as Thew and Huguenot, especially the latter, if sown in conjunction with field peas, coastal farmers have the means at hand of successfully and profitably cultivating portions of their holdings for winter fodder crops.

EXPORTING PLANTS TO THE UNITED STATES.

THE United States Government has issued the following regulation relating to certificates and particulars required in connection with plants intended to be imported into the United States of America :—

On and after 1st July, 1913, certificates and copy certificates shall give the date of inspection, name of the grower, the district or locality, the country where grown, a statement that the stock has been inspected by a duly authorised official, and found, or believed to be, free from dangerous insects or plant diseases The original certificate shall be signed and sealed by, and the copy certificate shall bear the seal of, the responsible inspection official for the country of origin.

Harvest Reports, 1912.

HAWKESBURY AGRICULTURAL COLLEGE.*

J. W. HADFIELD, Instructor in Agriculture.

THE rainfall during the year under review has been somewhat more evenly distributed than that of 1911. With the exception of September and October, the precipitation has been well up to requirements, at the same time being such that the early sown crops secured a very decided advantage over the later ones. This peculiar distribution of the rainfall is so frequently the case, that for this reason alone early sowing is to be strongly recommended. By following out this plan many of the late varieties can be grown, and, if so arranged that they can be harvested not later than October, there should be very little damage from their chief enemy—rust.

The rainfall during the year has been :—

January	...	1·275 inches.	August	...	2·012 inches
February	...	4·250 ,,	September	...	·340 ,,
March	...	2·530 ,,	October	...	·920 ,,
April	...	2·260 ,,	November	...	3·410 ,,
May	...	2·435 ,,	December	...	2·770 ,,
June	...	2·215 ,,			
July	...	7·905 ,,	Total	...	32·322 inches

Average for 32 years, 30·358 inches.



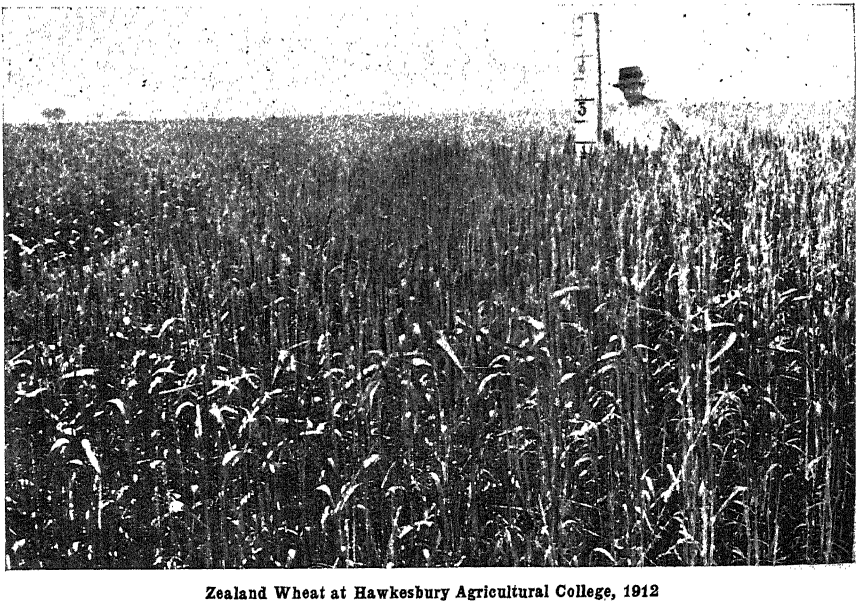
Reaper and binder in Cleveland Wheat at Hawkesbury Agricultural College, 1912.

* I wish to acknowledge the assistance rendered by Mr. Cobb, Farm Foreman, in compiling these few notes.—J. W. H.

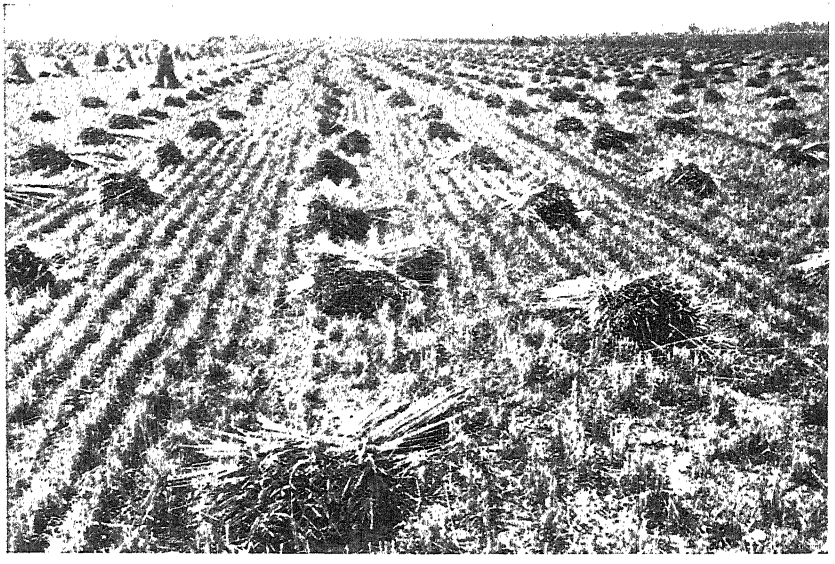


Harvesting Cleveland Wheat in Clarendon Paddock at Hawkesbury Agricultural College, 1912.
Yield of hay, 52 cwt. per acre.

The details respecting the crops and their treatment have been tabulated for convenience in reference and comparison. The yields of grain from Thew and Warren have had to be estimated, as they are not yet threshed.

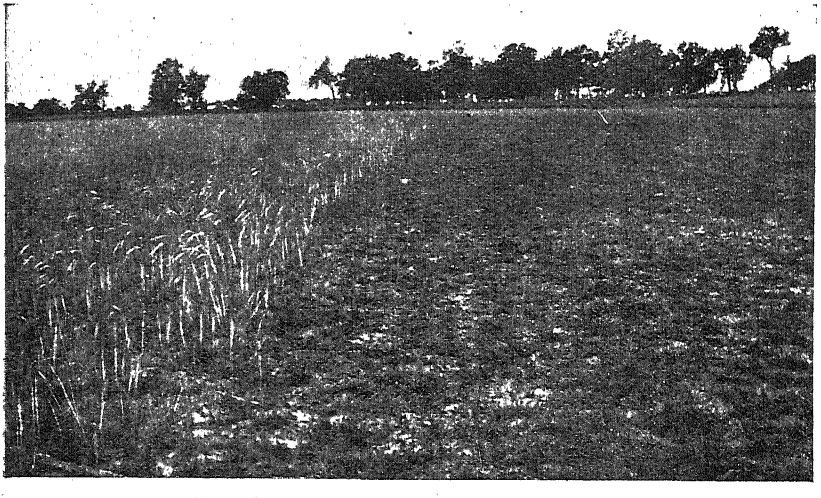


Zealand Wheat at Hawkesbury Agricultural College, 1912
Yield of hay, 41 cwt. per acre.



Stooking Zealand and Warren Wheats in the Clarendon Paddock, Hawkesbury Agricultural College, 1912.

The Clarendon paddock received two ploughings, and was well and thoroughly worked in preparation for seeding. This commenced towards the latter end of March, with Zealand and Cleveland, terminating with Warren. The last, maturing more quickly, was harvested before either of the

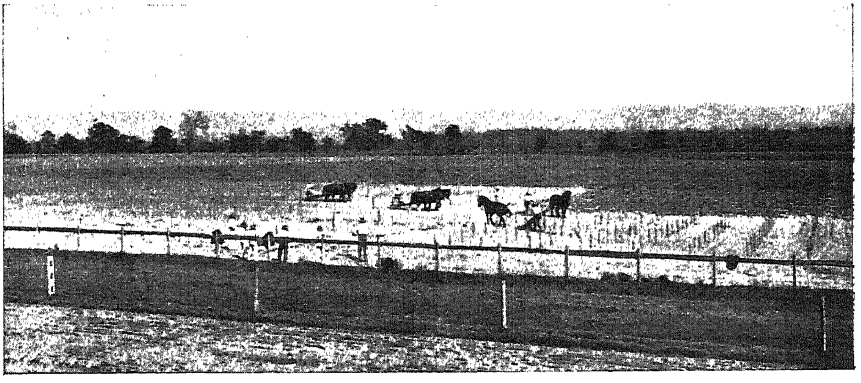


Rye and Oats at Hawkesbury Agricultural College, 1912.

Sheep were grazed on the crops, and they showed their preference for the oats by eating them off close, and leaving the rye, which is seen in ear

other two. Cleveland gave by far the best yield, and for quality of hay, especially in softness and colour, was unsurpassed by any of the others. It speaks well for this variety, that over half of it received no manure, only the higher and drier portions receiving any fertiliser. Further than this, the paddock includes a few acres of swamp, and though in these places the crop was very rank, no sign of rust was evident. Warren also was free from this disease, while Zealand showed a little damage in places. Moreover, we do not find the colour of Zealand too satisfactory, and Warren is, perhaps, a little harsh in the straw.

An attack of army worms did a little damage to this paddock, but the crop was really too far advanced to suffer, and the pest directed its attention to some newly-planted maize adjoining, doing considerable damage there.



Cultivating Examination at Hawkesbury Agricultural College, 1912.

Eighty-three acres of the Glebe paddock were sown for demonstration purposes, the rest being taken up by experiments. Fifty-three acres of Warren returned a satisfactory yield of over 7½ bags. Thew gave a poorer yield, largely on account of the seed being damaged; though sown as heavily as 88 lb. per acre, it came up very thin.

Firbank for hay gave a satisfactory yield, but owing to the straw being so weak, and not of the best of quality, it is intended to omit this variety as much as possible in the future. Only a very small area of Florence was sown. It yielded 2½ tons of excellent hay per acre. As an early variety it seems very well suited to our conditions, and it is intended to sow a larger area next April.

No. 6 paddock was planted with Algerian oats. It was sown late, and the heavy rains in July tended to check its growth somewhat. The very dry and hot weather of September and October forced the crop into head before attaining any height, the result being that 40 acres were too short to cut, and were fed-off. The rest, however, gave an excellent sample of hay,

Hawkesbury Agricultural College, Harvest, 1912.

Crop.	Paddock.	Area in Acres.	Variety.	Seed per Acre.	Commenced Planting.	Manure per Acre. Equal quantities of B. and B. and Superphosphate No. 1.	How Utilised.	Commenced Harvesting.	Yield per Acre of Hay or Grain.
		acres.		lb.					
Wheat	Clarendon ...	47	Cleveland ...	60	22 Mar. .	20 acres, 75 lb. ... Balance unmanured.	Hay	26 Oct. ...	52 cwt.
,, ...	,, ...	43	Zealand ...	60	5 April	33 acres, 75 lb. ... Balance unmanured.	,, ...	16 ,, ...	41 ,,
,, ...	,, ...	26	Warren... ..	78	20 ,, ...	75 lb.	,, ...	7 ,, ...	40 ,,
,, ...	Glebe ...	8	,, ...	78	5 May...	40 ,,	,, ...	18 ,, ...	40 ,,
,, ...	,, ...	9	Firbank ...	78	6 ,, ...	40 ,,	,, ...	30 Sept.	45 ,,
,, ...	,, ...	3	Florence ...	78	4 ,, ..	40 ,,	,, ...	27 Oct. ...	50 ,,
,, ...	,, ...	53	Warren... ...	78	22 April	40 ,,	Grain	15 Nov.	23 bushels.
,, ...	,, ...	7	Thew	88	23 May ...	40 ,,	,, ...	15 ,, ...	15 ,,
Oats	No. 6... ...	50	Algerian ...	100	1 June...	100 ,,	Hay	14 ,, ...	12 cwt.
,, ...	,, ...	40	,, ...	100	1 ,, ...	100 ,,	Fed-off by horses...	Nov.	.....
Rye	No. 5... ...	75	Giant	75	20 ,, ...	84 ,,	,, sheep ...	August.	.....
Mixtures ...	No. 5... ...	9	Sk. Barley ... 62 Rape 5	18 ,, ...	84 ,,	,, ,, ...	,,	.....
,, ...	,, ...	7	Oats ... ... 100 Rape 5	17 ,, ...	84 ,,	,, ,, ...	,,	.....
,, ...	No. 2... ...	5	Barley... ... 50 Rape ... 5	8 Mar. ...	75 ,,	,, ,, ..	June.	.....
,, ...	,, ...	9	Barley... ... 50 Vetches ... 30	8 ,, ...	75 ,,	,, ,, ...	,,	.....
,, ...	No. 3... ...	40	Barley.. ... 50 Rape 7	12 Feb. ...	75 ,,	,, ,, ...	May.	.....
,, ...	Blacktown ...	12	Oats ... ... 77 Vetches ... 30	12 July ...	50 ,,	,, cows ...	Nov.	.. ...
,, ...	Piggery, No. 2	8	Barley... ... 50 Rape 5	27 Mar....	84 ,,	,, pigs ...	July.	.....
,, ...	,, No. 3	8	Barley... .. 50 Rape 6	29 ,, ...	84 ,,	,, sheep ...	,,	.....
,, ...	Calf Paddock	6	Oats ... ... 80 Vetches ... 30	14 June...	100 ,,	,, cows ...	October.	.....

with a very heavy head. Rain, during hay-making operations, somewhat spoiled the quality of what would otherwise have been the best hay made during the harvest.

In No. 5, Giant rye and two mixtures, viz., oats with rape, and barley with rape, were sown. It was solely intended for grazing, and with the object of preventing the rye running to head, the sheep were put in very early. Their preference for the two mixtures, especially barley and rape, was so marked that they scarcely interfered with the rye, except while it was very young. The result was that the latter came into head, while the rest of the paddock was eaten bare of every vestige of growth. The rye crop was not worth harvesting, and it is intended to plough it under as a self-sown crop, sowing rape with it for green feed during the winter.

Mixtures of various kinds, chiefly a cereal with either rape or vetches, were sown in other convenient paddocks around the farm. Those sown early came on best, as there was not much shoot after August.

In paddock No. 2, where barley with rape and barley with vetches were sown in adjoining blocks, the sheep showed a preference for the former mixture. This was most marked, in spite of the fact that the growth of vetches which, contrary to our experience last year, was very profuse, had an undoubted influence in increasing the luxuriance of the barley.

The mixtures are sown with a 15-disc drill and grass-seed attachments. The rape is broadcasted behind the discs, a harrow following to cover the seed lightly. This plan is a decided improvement on mixing the seed, as they can be buried more accurately to their respective depths.

BATHURST EXPERIMENT FARM.

R. W. PEACOCK, Manager.

A REVIEW of the many factors which combine to give a certain result agriculturally must always be profitable, and those during 1912 are extremely interesting. Many of the conditions were decidedly abnormal, and could not be foreseen or arranged for satisfactorily. The experiences of the past year upheld many of the recommendations previously made, taught valuable lessons, and provided interesting suggestions for further research. The importance of a satisfactory physical condition of the soil was strikingly exemplified during the year.

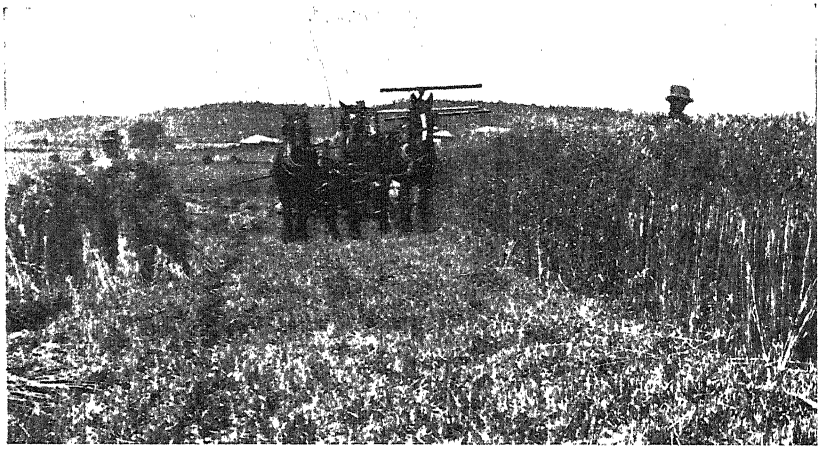
This review deals with the crops upon the Demonstration Area, which is dissociated from the experiment areas. The crops are grown as far as practicable upon commercial lines, and are of special interest to the farmer. The system of farming followed on this area is a mixed one, sheep being grazed in conjunction with the growth of the main winter cereals.

Rotation.

This combination allows of a profitable crop rotation, in this instance a two-course one. The area is practically divided into two portions, one being under main cereal crops and the other under fodder crops for the sheep the same year. The portion under main cereal crops in one year is brought under fodder crops the next.

Short Fallow.

This system allows of a short fallow of approximately five months preceding the main cereal crops. This short fallow conserves moisture, and allows of considerable quantities being carried over to augment the rainfall throughout the crops' growing season. Generally speaking such is necessary to obtain maximum yields. During the fallow period, owing in some measure to the moisture conserved and the killing of weeds, plant-food material is rendered available, which materially assists the early growth of the crops to follow.



Crop of Algerian Oats at Bathurst Experiment Farm, 1912.

The fodder crop is sown from the middle of February to early March, and consists of rape and Cape barley, or rape and Algerian oats in alternate drills. These mixtures have proved excellent in the past and are fed-off for about five months, approximately from the middle of May to the middle of October. The stock are then removed, and before the barley, rape, &c., can produce seeds, the land is ploughed and left fallow until the following March or April, when the main crops are sown. Throughout the fallow period, if rains induce weeds they are destroyed by skim ploughing, as it is imperative that all weeds should be destroyed; otherwise fallowing is in no small measure a farce. The weeds pump out moisture and lock up plant-food material, the opposite of which should be aimed at.

The whole of the area placed under main cereal crops during 1912 was treated as above, and considerable quantities of moisture had been conserved

in the subsoil. It was estimated that in one paddock, on the 31st January, an equivalent of from 25 to 26 inches of rainfall was conserved in the first 10 feet of soil and subsoil. This quantity was reduced during the dry autumn months, during four of which only 225 points of rain fell.

The rainfall for the year 1912 was but 17 inches, being 6½ inches below the average. The droughty conditions of the early part of the year were broken by good rains on the 9th June, which were followed by further good rains; in all, 1,022 points falling during June, July, and August, the three coldest months of the year. The outstanding features of the year were a very dry autumn (which seriously interfered with and practically prohibited germination, excepting in certain patches), an excessively wet period directly



Crop of Cape Barley at Bathurst Experiment Farm, 1912

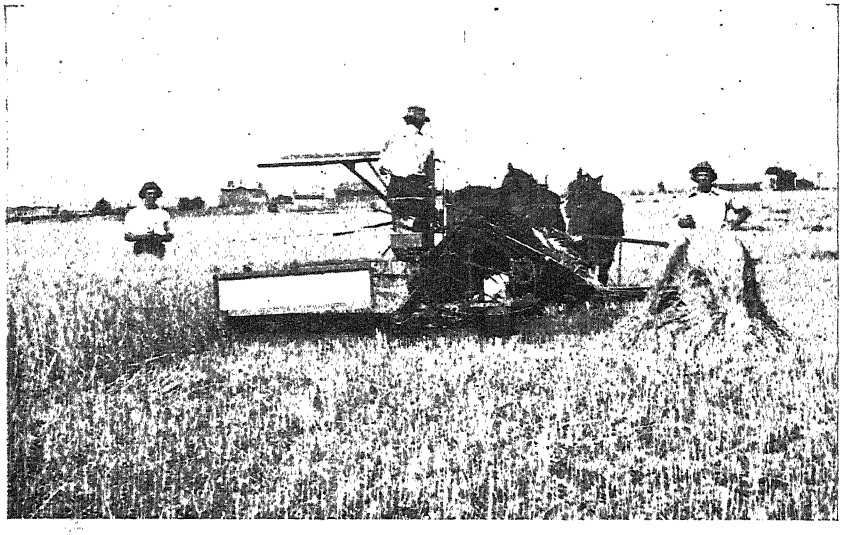
after the drought broke (which saturated the fallowed lands and kept them too cold for satisfactory growth), and insufficient rains during November and December. The above features agriculturally were abnormal and unsatisfactory. The distribution of the 17-inch rainfall was anything but satisfactory.

The dry autumn precluding general germination of the grains allowed of very late germination, approximately the end of June, which was equivalent in the majority of cases to late seeding. The practice at this Farm, as will be seen from the attached table, is to sow when sowing time comes round, irrespective of favourable conditions, and practically all the crops were sown in a dry seed-bed. It was well that they were, for the continuous rains after the break in the weather resulted in soil conditions on the fallows, which would have meant the bogging in of the seed. This feature is one that must be considered when discussing the merits or demerits of sowing after or before rains.

Early versus Late Seeding.

Early seeding has been strongly recommended for this district, and late seeding deprecated. Early, judicious seeding, followed by early germination, ensures root and top development, which prevents the soil from running together by winter rains and prevents water-logging. Both running together of the soil and water-logging occurred this season on account of the lack of growth.

Comparisons of a crop of Algerian oats were made, a portion of which germinated directly after seeding in April, and another which germinated at the end of June. That which germinated in April yielded at the rate of 84 bushels per acre of grain and 4 tons 12 cwt. of hay; whereas the portion



Crop of Standwell Malting Barley at Bathurst Experiment Farm, 1912.

germinating in June gave 43 bushels of grain per acre and 1 ton 17 cwt. of hay. It is not assumed that these striking differences are due solely to difference of periods of germination, but in the main they were, for extraordinary differences were noticeable throughout the Farm. The initial differences, which allowed of the germination of the one and not of the other, were due to physical characteristics, and had a decided bearing upon the result.

Organic Matter.

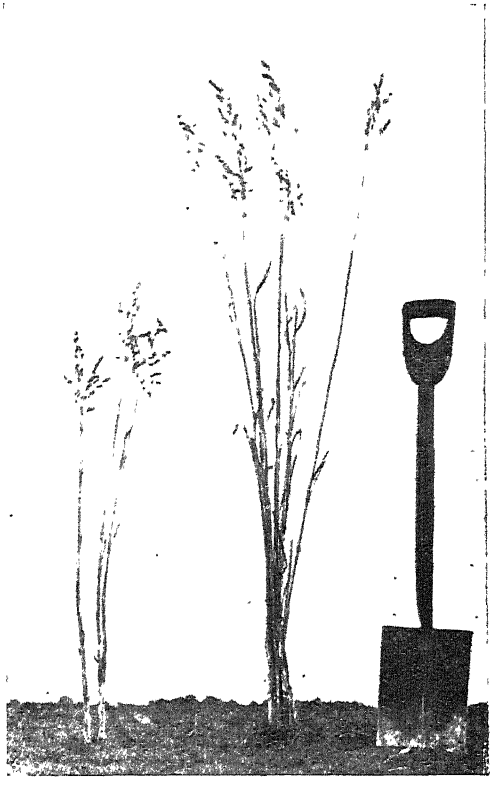
The value of undecomposed organic matter in preserving tilth under adverse conditions was fully demonstrated, and those areas at this Farm and throughout the district possessing the greatest quantity of plant residues gave the best results, owing to the better physical condition of the soil being retained after conditions calculated to put the soil out of tilth.

Effect of Fallowing.

The excessive rains, augmenting the large quantities of soil moisture conserved by good clean fallows, were unfortunate, as they brought about a most unsatisfactory water-logging, which placed the fallowed areas in a far worse condition for a time than the unfallowed areas. Many did not thoroughly recover prior to harvest. This gave some unfallowed areas the advantage for a while, but, owing to the falling-off of the rainfall during November and December, the fallowed areas reasserted themselves somewhat and, generally speaking, gave the best returns. The generally high results from fallowed areas, as against the unfallowed portions, were not apparent this year, but farmers must remember that the conditions were quite abnormal.

Weeds.

The failure of the grain to germinate directly after seeding, allowed those weeds which prefer wet and cold conditions to germinate at the same time as the main cereals, and to compete with them to their disadvantage. The two which gave the greatest trouble were Shepherd's purse and Chickweed; Silky grass (*Festuca bromoides*) got rather too good a footing. With early germination these weeds are placed at a disadvantage, and the crop is pre-eminent. Farmers throughout other districts complained of the prevalence of weeds, notably of Shepherd's purse.



Comparative growth of Oats at Bathurst Experiment Farm, 1912.
The plant on the right germinated before rain, and that on the left after.

Effect of Cold.

The cold conditions of June, July, and August, together with the water-logging, owing to excess of rain, had a very marked effect upon the various crops; the oats and barleys thriving, whereas the wheats were placed at a decided disadvantage. The oats and barley crops were very good and equal to those grown during the best of seasons, whereas the wheats were seriously affected, the highest yield of wheat being only 26 bushels 57 lb.; during

other seasons 40-bushel crops are reached. The oats in particular appeared to revel under conditions which were inimical to wheat. In patches which, owing to the conformation of the fields, were wetter than others owing to soakage from higher levels, the oats did remarkably well, whereas on similar patches the wheats were very poor indeed. That oats and barleys can withstand cold, wet conditions better than wheats was markedly demonstrated.

Sowing in Dry Seed Bed.

Owing to sowing wheats, oats, and barleys in a dry seed-bed, comparisons were impossible. Cleveland wheat and Algerian oats were sown in April on fallowed land. In both paddocks grain came up in patches during April. The bulk of the seed, however, had to wait until the rains in June. It was found after the rains that a large proportion of the wheat failed to germinate at all, whereas the Algerian oats germinated well. It was estimated that 80 per cent. of the wheat failed, whereas 80 per cent. of the oats germinated.



Harvesting Bobs Wheat at Bathurst Experiment Farm, 1912.

Cape barley also, some of which was sown as a fodder crop in March, came up in patches in April, and a large percentage of the balance came up in June, after the drought broke. Throughout the Farm, the fact that oats and barleys withstood the conditions, when sown in a dry seed-bed, better than wheat was apparent. Such is no doubt due to the adherent flowering glumes of the oats and barleys acting as an insulator for the grain, which is not the case with the bare grain of wheat, a large proportion of the latter having malted.

Harrowing the Growing Crops.

Owing to the consolidation of the soil, due to the excessive moisture, it was deemed wise to harrow the growing wheat crops; portions were left unharrowed for comparison. Newly-pointed harrows were used to cut the solid surface. The results were conflicting, and in no way decisive, due, perhaps, to the fact that upon the fallowed land no crops suffered for want of moisture prior to harvesting.

Shortage of Summer Rains.

The shortage of rains during November and December did not affect the crops upon the fallowed lands; no evidence of lack of moisture was discernible. The low yields of the wheat crops were due to the lack of satisfactory growth during the cold months after germination. Such results are more likely in a district with cold winters and sluggish growth than in the warmer sections of the wheat belt, where winter growth is faster and more continuous.

The harvest was about fourteen days later than during normal seasons, and December proved a more critical month than usual.

Manuring.

The manurial practice was similar to previous years, viz., the applying of 56 lb. of superphosphate to the fodder crop the preceding year, and 30 lb. of superphosphate with the wheat at seeding time upon the lighter lands, the richest portions being left unmanured when sowing the wheat. Check strips were left for comparison, and the effect of the manure was very marked, and resulted in an average increase of 5½ bushels per acre in favour of the 30 lb. per acre of superphosphate. This amount represented an increase of 36 per cent.

An application of superphosphate has been recommended in the past to hasten growth when crops are sown late; the value of such advice was demonstrated by the results from the unavoidably late crops due to late germination.

Varieties.

The three main varieties recommended for the district are Cleveland for early, Federation for mid-season, and Bobs for late sowings. Other than these were sown on the Demonstration Area this season, not because they were thought to be better, but because seed of other than the above three favourites were required by the Department and other farmers.

The three recommended have more than held their own. Although Federation is credited with the highest yield, viz., 26 bushels 57 lb., the paddock in which it was grown was not comparable with the others. Where fairly reasonable comparisons were possible, Bobs topped the yield with 26⅔ bushels. Cleveland came next, followed by Federation. Federation upon the lower portions of the paddock was cut by frost, and so also was Bayah. Bayah appeared to relish the conditions least of all. Thew was

Demonstration Area, Bathurst Experiment Farm, 1912.

STATEMENT of Treatment, Yield, &c., of Crops.

Paddock No.	Area.	Variety.	Previous Crop.	Treatment.	Seed per Acre.	Manure per Acre.	Date Sown.	Date Harvested.	Yield per Acre.	Remarks.
	acres.				lb.		1912.	1912.	bus. lb	
1A	1·05	Skinless barley	Cape barley and rape.	Ploughed 6 inches, on 22/9/11.	37·96	31·98 lb. superphosphate.	9 May ..	21 Nov. ..	23 28	One-third of this crop was cut badly with frost.
	2·29	Standwell malting barley.	,, ..	Ploughed 4 inches, on 8/1/12.	,,	,,	10 May ..	4 Dec. ..	49 15	
	3·65	Cape barley,	,, ..	Ploughed 4 inches, on 26/4/12.	,,	,,	10 May ..	2 Dec. ..	51 3	
1	11·60	Algerian oats for hay.	,, ..	Ploughed 6 inches, on 6/10/11.	42·17	31·98 lb. superphosphate.	9 & 10 April	26 Nov. ..	2 tons. bus. lb.	*From portions which germinated before rain.
	2·72	Algerian oats for grain.	,, ..	Ploughed 4 inches, on 10/1/12; ploughed 4 inches, on 26/3/12.	,,	,,	9 & 10 April	7 Dec. ..	43 12	From portions which germinated after rain.
2A	12·06	Cleveland wheat for hay.	,, ..	Ploughed 6 inches, on 21/10/11.	28·19	30 lb. superphosphate.	1 & 2 April	28 Nov. ..	1 ton 3 cwt.	* A large percentage of the grain originally sown malted before the rains in June.
	3·30	Cleveland wheat for grain.	,, ..	Ploughed 4 inches, on 11/1/12; ploughed 4 inches, on 27/3/12.	Resown in July, at rate of 8·98 lb.	30 lb. superphosphate, applied when resown, at rate of 12·76 lb. p.a.	1 & 2 April	26 Dec. ..	bus. lb. 19 44	Resowing carried out when land was too hoggy for best results.
2	4·53	Yandilla King..	,, ..	Ploughed 6 inches, on 3/11/11.	32·81	30 lb. superphosphate.	30 April ..	24 Dec. ..	17 8	All practically comparable excepting Cleveland, which was sown as Stud wheat, in drills 14 inches apart.
	7·03	Federation ..	,, ..	Ploughed 4 inches, on 13/1/12.	,,	,,	30 April ..	18 Dec. ..	17 28	
	7·48	Bayah	,, ..	Ploughed 4 inches, on 12/4/12.	,,	,,	30 April ..	24 Dec. ..	12 36	
	4·42	Thew	,, ..	Ploughed 4 inches, on 12/4/12.	,,	,,	30 April ..	18 Dec. ..	12 26	Thew was badly cut with the frost.
	2·26	Bobs	,, ..	Ploughed 4 inches, on 12/4/12	,,	,,	30 April ..	14 Dec. ..	26 40	
	2·0	Cleveland ..	,, ..	Ploughed 4 inches, on 12/4/12	,,	,,	30 April ..	24 Dec. ..	23 24	(Stud wheat.)
10	10·1	Federation ..	Maize and barley.	Ploughed 6 inches, on 25/10/11; ploughed 4 inches, on 18/1/12; ploughed 4 inches, on 17/4/12.	30	,,	6 May ..	13 Dec. ..	26 57	

NOTE.—In Paddocks 2 and 2A, superphosphate was only applied to hill ground. *Yields marked thus are estimated only.

very severely frosted right throughout, which considerably reduced the yield. Yandilla King was not affected by frost, which allowed it to go very close to Federation, to which it was adjacent.

The wheat yields were unquestionably disappointing considering the moisture conserved as compared with other years.

The average of the whole of the wheat on the Demonstration Area was 19⅓ bushels. The attached table shows the details of the operations and individual yields. The notes throw light upon the various factors leading up to the results.

Lessons from the Season.

The lessons from the seasons are: (1) there are factors which it is impossible to successfully arrange for by any farm practice; (2) the paramount importance of a desirable physical condition of the soil, generally designated tilth; (3) the importance of early seeding and early growth in districts with cold, wet winters to assist in retaining tilth; (4) the importance of undecomposed crop residues or organic matter in the soil; (5) the greater tolerance of wet, cold conditions by oats and barleys as compared with wheats; (6) the greater resistance of the grains of oats and barleys against the agencies favourable to malting when sown in dry seed-beds as compared with wheat; (7) the advantage of a judicious application of superphosphate in wheat-growing; (8) the necessity of studying the various characteristics of the different varieties in the choice of the most suitable.

Rainfall for 1912.

	Points.			Points.
January	150	September		87
February	96	October		189
March	9	November		100
April	14	December		27
May	6			
June	265	Total		1,700
July	452	1,022		
August	305			

GLEN INNES EXPERIMENT FARM.

R. H. GENNYS, Manager.

The season was not a very favourable one, owing to the small quantity of rain which fell during the growing period, and to heavy frosts in October, which cut the crops on the low land very badly and otherwise put things back very much.

The rainfall during the growing period and some time before was as follows :—

	Points.		Points.
April	Nil	October	223
May	14	November ...	285
June	418	December ...	124
July	336		
August	188	Total ...	1,763
September ...	175		

We sowed 27 acres of White Tartarian oats on new ground, which was ploughed once in June and July, disced in July, and sown 1st to 10th August. The seed was drilled at the rate of 60 lb. per acre, without any manure. The crop was cut on the 10th to 13th January, and the yield was 29 bushels per acre.

In the case of 5 acres of Algerian oats, the cultivation was the same as for the above 27 acres of White Tartarian oats. The seed was drilled in at the rate of 76 lb. per acre from the 1st to 10th August, and cut on the 22nd December, the yield being 41½ bushels per acre.

It will be seen that in both the above cases the land was sown two months after ploughing, and as the season was a dry one a big yield could not be expected.

Of Genoa wheat, just over 7 acres were sown after a crop of maize and potatoes. The land was ploughed once, harrowed, and rolled, and the seed was drilled at the rate of 55 lb. to the acre on the 7th May. The seed was untreated, as the ground was dry and the variety is a bunt resister. We cut it on the 6th January, and the yield averaged 28⅓ bushels per acre.

About 7¼ acres of Thew wheat were sown after a crop of maize and potatoes. The land was ploughed, harrowed once, and rolled, and the seed was drilled at the rate of 52 lb. per acre, having been treated with Fungusine. The crop was cut on the 24th December, and the yield ran 22¾ bushels per acre.

Of Haynes' Blue Stem wheat, 15 acres were sown, 12 acres after maize and 3 acres after wheat. The land was ploughed once, harrowed, and rolled, and the seed (untreated) was drilled in at the rate of 55 lb. per acre. The crop was cut on the 3rd January, and the yield averaged 19⅕ bushels per acre.

Haynes' Blue Stem is generally grown as a hay wheat.

No bunt was present in the crops this season.

Two large sheaves of oats were forwarded as part of the exhibit for Sydney Show, one Algerian and the other White Tartarian. The yields of hay of these two varieties were as follow:—White Tartarian, 18 acres, estimated at 2 tons per acre; Algerian, 5 acres, estimated at 2½ tons per acre.

List of Fertilisers in New South Wales.

F. B. GUTHRIE AND A. A. RAMSAY.

1913 List.

THE accompanying list of manures obtainable in New South Wales, together with their composition, as guaranteed by the vendors, and their values, is the result of the revision of the list issued in May, 1912.

The list is published in the interest of the farmers, and it is hoped that it may serve as a guide to those requiring any particular class of manure.

It must be clearly understood that the figures given are not those obtained by analysis of the sample by the Department. They represent the guarantees given by the vendors in accordance with the provisions of the Fertilisers Act.

Where possible, samples have been taken from bulk by one of the officers of the Department, and only those manures are inserted in the list which have been found on analysis to be up to the guarantee.

A word is necessary in explanation of the column giving the "values" of the manures. These figures are calculated from the composition of the manures as represented by analysis, a definite unit-value being assigned to each of the fertilising ingredients. The units on which the values here given are computed are as follow :—

UNIT-VALUES of fertilising ingredients in different manures for 1913.

	Per unit. s. d.
Nitrogen in nitrates	17 0
,, in ammonium salts	15 7
,, in blood, bones, offal, &c.—fine	15 0
Phosphoric acid in bones, offal, &c.—fine	2 10
Phosphoric acid in superphosphate and mineral phosphate—	
Water-soluble	5 0
Insoluble	2 9
Potash in sulphate of potash	5 7

PRICE per lb. of fertilising ingredients in different manures for 1913.

	Pence per lb.
Nitrogen in nitrates	9·1
,, in ammonium salts	8·3
,, in blood, bones, offal, &c.—fine	8·0
Phosphoric acid in bones, offal, &c.—fine	1·5
Phosphoric acid in superphosphate and mineral phosphate—	
Water-soluble	2·7
Insoluble	1·5
Potash in sulphate of potash	3·0

To determine the value of any manure the percentage of each ingredient is multiplied by the unit-value assigned above to that ingredient, the result being the value of that substance in the ton of manure. For example, a bone-dust contains 4 per cent. nitrogen and 20 per cent. phosphoric acid :—

4 x 15s. 0d. = £3 0s..0d. = value of the nitrogen per ton.
20 x 2s. 10d. = £2 16s. 8d. = value of the phosphoric acid per ton.

£5 16s. 8d. = value of manure per ton.

It must be clearly understood that the value thus assigned, depending solely upon the chemical composition of the manure, does not represent in all cases the actual money value of the manure, which depends upon a variety of causes other than the composition, and is affected by local conditions; neither does it represent the costs incurred by the manufacturer in the preparation, such as cost of mixing, bagging, labelling, &c., nor freight. It is simply intended as a standard by which different products may be compared. At the same time, it has been attempted to make the standard indicate as nearly as possible the fair retail price of the manure, and the fact that in the majority of cases the price asked and the value assigned are fairly close shows that the valuation is a reasonable one.

Some agents guarantee two figures—for instance, "from 16 to 18 per cent. phosphoric acid." In these cases the lower one has been published in the list, as it will certainly be the one the vendors will rely upon in cases of dispute.

Now that the Fertiliser Adulteration Act is in force, the purchaser has only himself to blame if he pays for an inferior article. Every vendor is obliged to furnish a guarantee with every delivery of fertiliser, setting forth its actual composition as determined by analysis.

If the purchaser has any reason to suspect the genuineness of the guarantee, all he has to do is to notify the vendor of his intention to take samples for analysis, in sufficient time to enable the vendor or some person appointed by him to be present. The samples must be taken before the consignment is finally in the purchaser's possession; for example. if the fertiliser is sent by rail, the sample should be taken at the railway station or siding. Three samples must be taken, one being given to the vendor or his representative, the second kept by the purchaser and submitted to an analyst, and the third forwarded to the Department of Agriculture for future reference, in case of divergence in the analyses of the other two. All three samples must be sealed up.

In the case of bone-dust, blood and bone manures, &c., the valuation has been made irrespective of the fineness of division, and is based on the amounts of fertilising ingredients only; but it must be borne in mind that finely ground bone-dust acts more rapidly than coarse, and that unground fragments of bone only become available as fertilisers very slowly.

A word may be added in explanation of the term "water-soluble phosphoric acid." When bones or mineral phosphates are acted on by sulphuric acid, a

portion of the tricalcic phosphate is converted into another lime compound, known as monocalcic phosphate or superphosphate. This compound is soluble in water, and it is to its presence that the rapid action of the phosphate is due. This is the "water-soluble" acid of the table. In many superphosphates, however, a considerable portion of this compound has undergone change. This change may be due to the salts of iron and alumina present, or to the length of time it has been kept, and it results in the formation of a third lime compound—bi-calcic phosphate. This is known as "reverted" or "retrograde" phosphoric acid, and is insoluble in water, but soluble in ammonium citrate.

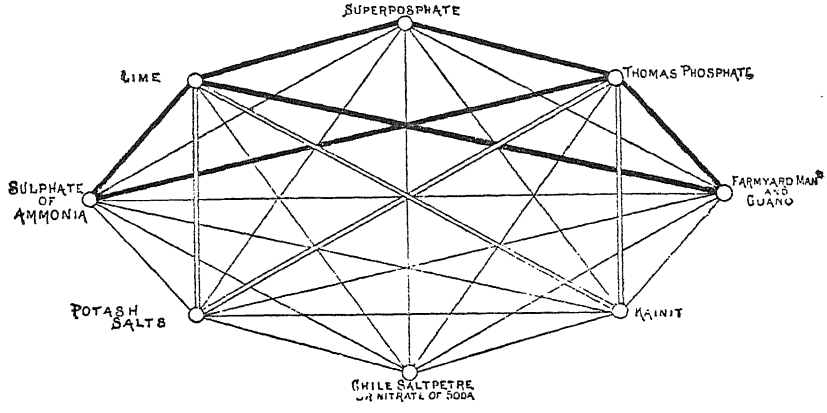
In the fourth table are a number of waste products which may in many cases be economically utilised.

When purchasing a manure always insist on a guarantee of its composition as determined by analysis.

Artificial manures should be mixed with about three times their weight of dry loam, and distributed evenly.

Never add lime to a manure containing sulphate of ammonia or blood and bone manures, as in these cases loss of nitrogen results; and when lime has been applied to the land do not use such manures until about three weeks afterwards.

The accompanying fertiliser diagram, which represents in a graphic manner the points to be taken into consideration in the mixing of different manures, is reproduced in the hope that it will be found useful to farmers who make up their own mixtures. The diagram originates with Dr. Geekens, Alzey, Germany, and is taken from an article by Mr. Leo. Buring in the *Garden and Field* of 10th October, 1903.



Substances connected by thick line must not be mixed together.
Substances connected by double line must only be mixed immediately before use.
Substances connected by single thin line may be mixed together at any time.

I.—Simple Fertilisers.

Manure.	Where obtainable.	Guaranteed Composition.					Value.
		Nitrogen.	Equivalent to Ammonia.	Lime.	Potash.	Phosphoric Acid.	
							£ s. d.
Sulphate of ammonia	Australian Gaslight Co., Kent-street	20·4	24·8	.....	.....	.....	15 17 11
,, ,, ...	Geo. Shirley, Ltd., 279 George-street	20·4	24·8	.....	.....	.....	15 17 11
Kainit	,, ,, ...	.. ...	.....	.....	12·5	.....	.....
Sulphate of potash	,, ,, ...	.....	.....	.....	52·0	.....	14 10 4
Sulphate of ammonia	Paton, Burns, and Co., 75 York-street... ...	20·4	24·8	.....	.....	.....	15 17 11
Kainit	,, ,, ...	.....	.....	.....	12·8	.....	.....
Sulphate of potash	,, ,, ...	.....	.....	.....	52·0	.....	14 10 4
Sulphate of ammonia	Farmers' Fertilisers Corporation, Ltd., 2 Bridge-street.	20·4	24·8	.. ...	.....	.....	15 17 11
Nitrate of soda	,, ,, ,,	15·9	19·31	.....	.....	.....	13 10 3
Nitrolim	,, ,, ,,	18·0	21·86	.....	.. ...	.....	14 0 0
Sulphate of potash	,, ,, ,,	.....	.. ...	... ..	53·0	.....	14 15 11
Gypsum fertiliser	,, ,, ,,	.. ...	.....	96·0 Cryst. $CaSO_4$	.....	.....	.....
Thomas phosphate	,, ,, ,,	.....	.....	.....	.....	18·0	.....

II.—Bone and Blood Manures.

Manure.	Where obtainable.	Guaranteed Composition.				Value.		
		Nitrogen.	Equivalent to Ammonia.	Phosphoric Acid.	Equivalent to Tricalcic Phosphate.	£	s.	d.
Blood and bone	J. Barnes, Granville South	5·21	6·32	15·74	34·36	6	2	9
,, ...	Kitchen & Sons, Ltd., 365 Kent-street	5·00	6·07	17·0	37·11	6	3	2
White bone-dust	,, ,, ,, ...	3·5	4·25	25·0	54·58	6	3	4
Phosphatic bone-dust	The Wooster Fertiliser Co., Epping	3·30	4·00	20·61	45·00	5	7	11
Pure steamed bone-dust	,, ,, ,, ...	3·91	4·75	24·50	53·50	6	8	1
Bone and blood fertiliser	,, ,, ,, ...	5·76	7·00	13·74	30·07	6	5	4
Raw or green bone-dust	,, ,, ,, ...	4·01	4·86	24·41	53·30	6	9	4
No. 3 Special Fertiliser	Co-operative Wholesale Society, Ltd., Alexandria	5·5	6·68	17·00	37·11	6	10	8
Excelsior bone-dust	M. Gearin, Old Botany road, Mascot	3·7	4·5	23·47	57·24	6	2	0
Blood	B. Richards and Sons, Ltd., Riverstone	13·86	16·83	.....	.....	10	7	11
Bone and blood	Farmers' Fertilisers Corporation, 2 Bridge-street.	4·91	5·96	18·0	39·30	6	4	8
Bone-dust	,, ,, ,, ,, ...	4·25	5·16	21·85	47·70	6	5	8
Bone and blood	John Cooke & Co., Sandown Freezing Works ...	6·85	8·32	10·44	22·82	6	12	4
Bone-dust	M. O'Riordan, O'Riordan street, Alexandria ...	3·70	4·5	21·98	48·0	5	17	9
Bone-dust, B.D.1	Paton, Burns, & Co., 75 York-street	3·7	4·5	22·12	48·29	5	18	2
,, B.D.2	,, ,, ,, ...	3·7	4·5	22·12	48·29	5	18	2
,, B.D.3	,, ,, ,, ...	3·3	4·0	20·7	45·19	5	8	2
,, B.D.4	,, ,, ,, ...	3·3	4·0	18·4	40·17	5	1	8
Bone and blood, B.B.1	,, ,, ,, ...	5·7	6·92	18·0	39·3	6	16	6
Bone-dust ***	R. S. Lamb & Co., 55 Pitt-street	3·91	4·75	22·90	50·0	6	3	6
,, A1	,, ,, ,, ...	4·12	5·00	19·24	42·0	5	16	4
Vulture	,, ,, ,, ...	3·3	4·0	18·32	40·0	5	1	5
Bone and blood	Silvester Bros., Regent-street, Redfern	3·45	4·19	23·63	51·59	5	18	9

III.—Superphosphates, Mixed Fertilisers, and Imported Fertilisers.

Manure.	Where obtainable.	Guaranteed Composition.				Value.
		Nitrogen.	Water soluble Phosphoric Acid.	Total Phosphoric Acid.	Potash.	£ s. d.
Superphosphate No. 1	George Shirley, Limited, 279 George-street	.....	17·0	.....	.....	4 5 0
,, No. 2	,, ,, ...	1·6	15·0	.....	1·0	5 5 6
,, No. 3	,, ,, ...	3·3	13·0	.....	2·0	6 7 7
,, No. 5	,, ,, ...	3·3	12·0	.....	7·0	7 10 6
,, No. 7	,, ,, ...	1·6	11·4	.....	1·0	4 7 6
,, No. 9	,, ,, ...	4·1	6·5	.....	4·0	5 18 9
,, No. 11	,, ,, ...	.....	11·4	.....	7·0	4 16 1
,, No. 12	,, ,, ...	3·3	5·5	14·7	2·0	5 16 2
,, No. 14	,, ,, ...	2·5	5·5	14·2	6·0	6 4 7
,, No. 18	,, ,, ...	... .	5·5	14·2	6·0	4 5 8
,, No. 19	,, ,, ...	4·1	4·1	11·4	2·0	5 16 3
,, A	,, ,, ...	0·5	.....	29·8	.....	4 11 11
,, M	,, ,, ...	1·6	.....	16·0	1·0	3 15 10
,, N	,, ,, ...	1·6	....	16·0	4·0	4 12 7
,, O	,, ,, ...	2·5	.....	13·7	6·0	5 11 3
Superphosphate	Paton, Burns, & Co., 75 York street	.....	17·0	... ...	.....	4 5 0
Complete Mixed Manures, P.B.1	,, ,, ...	4·3	4·25	9·75	5·0	6 11 3
,, ,, P.B.2	,, ,, ...	3·75	4·25	9·75	7·1	6 14 5
,, ,, P.B.3	,, ,, ...	3·4	5·10	9·0	7·1	6 8 10
,, ,, P.B.4	,, ,, ...	3·3	2·75	9·65	7·1	6 3 9
,, ,, P.B.5	,, ,, ...	4·3	4·25	9·75	2·4	5 16 9
,, ,, P.B.6	,, ,, ...	3·3	6·0	12·68	2·4	5 13 2
,, ,, P.B.7	,, ,, ...	1·7	6·8	13·47	1·2	4 5 6
,, ,, P.B.8	,, ,, ...	0·82	8·5	10·8	7·1	5 1 3
,, ,, P.B.9	,, ,, ...	2·47	.....	9·0	4·9	4 10 7
,, ,, P.B.10	,, ,, ...	2·47	.....	10·5	4·9	4 14 9
,, ,, P.B.11	,, ,, ...	2·47	.....	10·5	2·4	4 0 9
,, ,, P.B.12	,, ,, ...	1·6	.....	14·9	0·6	3 9 3
,, ,, P.B.13	,, ,, ...	.....	.....	12·0	7·1	3 12 8
Special Potato Fertiliser ...	The Wooster Fertiliser Co., Epping	4·52*	.....	14·19	5·0	6 16 4
Complete Fertiliser	,, ,, ,, ...	5·01†	.....	14·56	2·0	6 8 3
No. 1 Superphosphate	Farmers' Fertilisers Corporation, Ltd., 2 Bridge-st.	.....	17·0	.....	.....	4 5 0
A1 ,, ...	,, ,, ,, ...	.....	20·0	.....	.....	5 0 0
Bone ,, ...	,, ,, ,, ...	1·5	9·0	20·5	.....	5 0 0
Nitro ,, ...	,, ,, ,, ...	1·35	15·44	19·05	.....	5 10 1
A1 Cane manure	,, ,, ,, ...	11·0	4·0	.....	9·0	12 1 8
Special Crookwell Potato manure	,, ,, ,, ...	2·75	7·0	17·0	.....	5 5 4

* Containing 3·77 organic, 0·75 ammoniacal nitrogen. † Containing 3·81 organic, 1·20 ammoniacal nitrogen.

IV.—Waste-Products, Ashes, &c., not on the Market.

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Value. £ s. d.
Deposit from wool-scouring tanks. 1	Liverpool Wool-scouring Works.	....	.....	·64	·78	.....	.....	.....	·72	0 13 7
Deposit from wool-scouring tanks. 2	" " " ..	.....	.....	1·02	1·24	.....	.....	·16	·39	0 17 11
Deposit from wool-scouring tanks. 3	" " " ..	.....	.....	1·37	1·66	.....	.....	·14	·20	1 2 0
Deposit from breakers		34·47		1·81	2·20	50·68	·35	·88	1·60	1 18 6
Sediment from wool-scouring works.	" " " ..	19·57		·59	·71	78·24	·97	.....	·20	0 10 0
Scutch	Australian Glue-Gelatin Works, Alexandria.	56·98	.....	2·95	3·58	.....	4·56	None.	None.	2 4 3
" from limed pelts	Hugh Wright, Auburn ..	5·32	73·42	1·80	2·18	3·61	9·36	·89	·20	1 10 7
Decomposed hair and lime ..	Fellmongery	9·70	57·08	6·86	8·33	1·22	26·27	.....	.....	5 2 11
Tan-yard refuse	Tanneries, St. Mary's ..	6·43	33·83	2·24	2·72	21·43	26·96	·67	.....	1 15 5
Tan refuse	.....	7·10	50·90	2·62	3·18	16·03	18·58	·56	·18	2 1 10
Fleshings from tannery	.....	·91	75·37	4·43	5·38	5·98	.....	1·14	·04	3 9 10
Salt (sweepings from tannery) ..	....	3·04	.....	·70	·85	·38	.....	.....	.....	0 10 6
Wool-waste	.....	.....	.....	8·15	9·89	.....	.....	.....	... .	6 2 3
Peat "	.....	34·33	28·20	1·97	2·39	26·03	2·75	·37	·32	1 12 4
"	H. Tager, Moss Vale ..	72·93	16·68	·35	·42	10·39 (ash).	.....	.....	.....	0 5 3
Burnt peat	S. Cook, Pyrmont.. ..	49·51	34·63	·75	·91	.....	.....	·06	·01	0 11 6
Filter-press muck	.....	.....	.....	.....	.....	84·45	.....	·25	·33	0 2 6
Megass	Cane-mills, Broadwater ..	16·39	26·07	·22	·27	34·86	13·20	5·98	·44	1 2 2
Megass ash	Clarence River cane ..	22·86	67·32	·63	·78	8·61	·30	·01	·05	0 9 9
"	" "	.....	.....	.....	.....	87·69	3·07	·16	·51	0 3 3
Bloodwood ash	Richmond River cane ..	.....	.....	.....	.....	.....	1·11	·21	4·79	1 7 4
Ironbark ash..	.....	.....	.....	.....	.....	.....	8·47	·27	5·25	1 10 2
Blackbutt ash	.....	.....	.....	.....	.....	.....	.....	·32	1·53	0 10 10
Red-gum ash..	.....	.....	.....	.....	.....	.....	7·27	·04	2·02	0 11 5
Spotted-gum ash	.....	.....	.....	.....	.....	.....	.....	·38	4·17	1 4 4
Boxwood ash..	.....	.....	.....	.....	.....	.....	.....	·10	·70	0 4 2
Grass-tree ash	.....	·86	1·78	.....	.....	33·48	24·94	3·07	5·30	1 18 0
Vine-cuttings ash	....	·49	.....	.....	.....	60·64	11·34	1·85	3·76	1 6 0
Red-apple ash	.....	.....	.....	.....	.....	54·52	13·96	·47	6·00	1 14 9
She-oak ash	.....	.....	.....	.....	.....	8·57	42·35	8·85	2·19	1 16 8
Hardwood ash	.....	.....	.....	.....	.....	62·38	13·50	1·76	3·09	1 2 1
Ash of wild melon	Stock Branch	....	.....	.....	.....	.....	5·12	4·85	27·08	8 4 6
Wood ashes	....	·30	.....	.....	.....	21·43	41·37	·35	2·80	0 16 7
"	Wentworth Irrigation Area	.....	.....	.....	.....	11·12	50·78	·58	3·21	0 19 6
Ash of kerosene shale	Hartley Vale	1·49	27·93	·70	·85	67·59	.....	·28	·14	0 12 0

IV.—Waste-Products, Ashes, &c., not on the Market—*continued.*

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Value. £ s. d.
Clinker from locomotive boiler ..	.....	.....	.....	.....	.....	.....	.....	.....	·25	0 1 6
Residue from furnace	R. E. Bragg, Marrickville	1·55	35·03	·54	·61	52·40	·64	·43	·09	0 0 9
Sea-weed ash	.....	.....	.....	.....	.....	.....	9·27	·49	·59	0 4 8
,, ...	.....	.....	.....	.....	.....	.....	6·29	1·27	17·55	5 1 6
,, ...	.....	·43	.....	.....	.....	56·28	9·39	·47	2·26	0 13 11
,, ...	Manly	.....	.....	.....	.....	43·06	6·52	·91	13·98	4 0 7
,, ...	,, ...	.....	.....	.....	.....	·07	·53	·19	34·30	9 12 0
,, ...	Mr. Harvey, Department	3·25	19·46	.....	.....	61·63	4·22	·33	·22	0 2 2
Sea-weed, fresh state	.....	80·00	.....	·16	·19	.....	·41	·09	1·18	0 0 9 3
Sea-weed	.....	41·03	42·49	·14	·17	.....	.....	·21	·60	0 0 6 0
Sea-weed, dried	.....	18·58	65·97	1·64	1·99	15·44 (ash).	3·44	·14	·14	1 5 9
Air-slacked lime	.....	16·58	.....	.....	.....	1·88	75·44	.....	.....	.....
Residue from calcium carbide ..	.....	41·36	.....	.....	.....	1·08	36·19	.....	.....	.....
Limestone rock	Queanbeyan	1·10	.....	.....	.....	4·70	48·20	1·22	.....	0 3 4
Agricultural lime	Portland Cement Co. ..	18·43	.....	.....	.....	23·80	Hydrate 13·80 / Carbonate 43·97	.....	.....	.....
Gypsum	Marulan	(Crystallised $CaSO_4$=92·64)				4·47	.....	.....	.....	.....
Cave deposit, shells, &c.	Cowan, Hawkesbury River	2·11	.....	·82	1·00	.....	35·40	1·59	·88	1 1 7
,, ,, ..	Macleay River	23·06	16·01	2·43	2·95	26·77	13·88	7·40	.....	2 16 10
Deposit (coral, shell, &c.)	Pacific Islands	2·13	13·53	·72	·87	.....	44·00	3·53	·39	1 3 3
Shells	Pambula River	.....	.....	.....	.....	.....	44·59	·10	.....	.....
Flue deposit	Maitland	.....	.....	.....	.....	83·75	2·56	·32	·31	0 2 7
,, ...	Liverpool	.....	.....	.....	.....	91·17	·42	1·29	·17	0 4 6
,, from sanitary furnace	.....	.....	.....	.....	.....	63·53	6·64	1·82	1·61	0 14 0
,, ...	.....	6·30	2·45	.....	.....	84·89	·32	·35	·38	0 2 10
Night-soil mixed with lime ..	.....	44·33		·74	·89	18·60	7·62	·78	.....	0 13 3
Night-soil	Wagga Wagga	6·70		·03	·04	82·19	·44	·28	·69	0 5 0
,, ...	,, ...	9·14		·28	·34	78·92	1·18	·18	·54	0 7 8
,, ...	,, ...	.....		·50	·61	.....	.....	·64	·62	0 12 9
Night-soil preparation, No. 1 ..	.....	8·22		3·73	4·63	50·22	13·32	9·65	·91	4 7 7
,, ,, No. 2 ..	.....	7·20		1·83	2·22	29·02	8·05	4·10	·15	1 19 6
,, ,, No. 3 ..	.....	25·95		1·64	1·99	60·17	1·39	1·61	·70	1 12 11
,, preparation, "Pinhoe" manure.	.....	·92	9·54	·21	·25	57·58	14·71	1·26	·56	0 9 9
Night-soil preparation	F. Artlett, Parramatta ..	7·92	30·06	2·10	2·55	46·38	2·09	1·93	·61	2 6 7
,, ,, ..	,, ,, ..	10·71	42·59	4·37	5·09	·24	30·12	·80	.....	2 15 7
,, ,, ...	*Mr. Halstead, O'Brien's* patent.	1·54	12·20	·54	·65	77·35	.....	·62	.....	0 0 10
,, ,, ...	.....	29·52	56·15	2·55	3·10	14·33 (ash).	.....	.....	.....	1 18 3

IV.—Waste-Products, Ashes, &c., not on the Market—*continued.*

Manure.	Original Source.	Water.	Volatile and Combustible.	Nitrogen.	Ammonia.	Insoluble.	Lime.	Phosphoric Acid.	Potash.	Value. £ s. d.
Farmyard manure	.....	67·06	22·09	·40	·49	8·16	·16	·20	·30	0 8 3
Stable manure	Bathurst	39·26	.....	·41	·50	.....	.....	·27	·67	0 10 7
Fowl manure	.....	3·95	16·48	1·47	1·78	70·16	2·10	1·94	.....	1 7 5
,,	.....	1·54	15·23	·86	1·04	79·96	·64	·59	·33	0 16 4
Sheep manure	Bathurst	7·73	.....	1·06	1·30	.....	.....	·69	1·17	1 4 4
,, ,, ,,	Liverpool Wool-scouring Works.	9·71	50·91	1·79	2·17	32·26	2·00	·91	·92	1 14 6
Sheep dag	.....	.....	.....	3·64	3·63	.....	.....	.....	.....	2 5 7
Refuse manure	Abattoirs	12·63	74·51	4·74	5·02	6·58	.....	1·20	.....	3 7 0
Flying-fox manure	.....	1·09	30·32	3·32	4·05	50·29	1·62	·36	1·15	2 17 6
Fish fertiliser	.....	14·47	64·36	10·37	12·59	4·52	.....	.....	.....	7 15 7
Shark fertiliser	.....	9·02	68·04	10·59	12·85	3·86	.....	7·27	.....	8 19 5
Fish manure	.....	10·88	59·26	6·10	7·40	5·39	9·82	8·28	.....	5 15 0
Rabbit hair, long	Anderson, Oxford-street	8·73	88·64	14·03	17·04	3·63 (ash).	.....	.....	.....	10 10 5
,, short	,, ,,	9·72	87·76	14·00	17·00	2·82 (ash).	.....	.....	.....	10 10 0
Bat-guano	.....	14·11	17·69	1·55	1·88	28·77	13·72	11·42	.....	2 14 8
,,	.....	10·86	19·65	2·24	2·72	51·95	1·75	3·55	·15	2 4 2
,,	.....	13·70	34·35	4·76	5·78	3·30	22·28	13·04	trace.	5 7 3
Bat deposit	Cave Flat, Cooradigbee	5·43	12·98	·59	·61	57·64	5·60	12·12	.....	2 0 10
Guano deposit	Tamworth ,, ,,	8·75	23·40	6·17	7·40	12·95	.....	9·24	.....	5 18 0
,, ,,	,,	8·42	20·97	3·10	3·76	31·39	.....	7·87	.....	3 8 1
,, ,,	,,	14·55	22·21	3·66	4·44	15·81	.....	12·08	.....	4 10 7
,, ,,	,, ,, ,,	6·45	44·92	6·72	8·17	7·22	.....	13·17	.....	6 19 2
Bone breccia	Queanbeyan	5·71	.....	·69	·72	9·45	42·60	3·11	.....	0 17 5
Muck from waterworks reservoir	Maitland	4·84	17·55	·74	·90	63·42	4·56	·31	·60	0 15 4
Muck raked from waterhole	.....	63·66	29·86	·81	·98	3·80	·96	·10	·06	0 12 9
Sawdust	.....	32·52	62·35	·82	1·00	.....	.....	1·70	·05	0 17 3
Decayed wood, bark and leaves, bloodwood.	.....	57·80		·74	·89	40·68	1·30	.....	.....	0 11 1
Decayed wood, bark and leaves, pepper-tree.	.....	79·92		·89	1·08	17·77	1·50	.....	.....	0 13 4
Coco-nut oil cake	.....	8·24	.....	3·29	3·99	.....	.....	1·20	1·49	3 1 0
Castor cake	.....	18·81	74·08	4·30	5·22	.....	.....	1·83	·86	3 14 4
Pea cake	Java	16·02	.....	7·24	8·79	.....	.....	1·46	1·17	5 19 1
Bean cake	North China	14·52	80·32	6·77	8·22	.....	.....	1·33	1·99	5 16 4
Rice husks	.....	42·74	42·15	1·07	1·30	13·77	·02	·03	·04	0 16 4
Field pea, whole plant	.....	88·58	9·97	·55	·67	.....	·15	·12	·49	0 11 4
Tares, whole plant	.....	83·97	14·96	·73	·88	.....	.....	·11	·21	0 12 5
Marsh mallow, whole plant	.....	79·00	17·86	·85	1·03	.....	.....	·14	·69	0 17 0
Horse bean, leaves and stalks	.....	82·87	15·90	·90	1·09	.....	·05	·11	·54	0 16 10

Insectivorous Birds of New South Wales.

[Continued from Vol. XXIII, page 754.]

33. Spotted Ground Bird.

SEVERAL other names are applied to this bird, and two of them, "Spotted Ground Thrush," and "Spotted Babbling Thrush," suggest associations that will assist in their identification. It is widely distributed over the southern portion of the continent, evincing a decided preference for fern and scrub-covered wastes, and lightly timbered country near the coast. It is fairly numerous in the coastal districts of New South Wales, and Mr. North has noted it on the Blue Mountains and scrub-covered ranges near the head of navigation of the Clarence River. Around Sydney he has frequently flushed it from low ferns and grass-trees, but always where sheltered above by trees of larger growth.

As the name implies, "the species is entirely of terrestrial habit," says Mr. Campbell, "running over the ground quickly, and rising when forced to fly, with a whirr of a quail or pigeon. However, I have seen it perched on thick limbs of trees, about 40 feet from the ground." It has a peculiar whistling note, but like the rest of the Australian members of the group, is rather silent.

The insectivorous habit is the testimony of several observers.

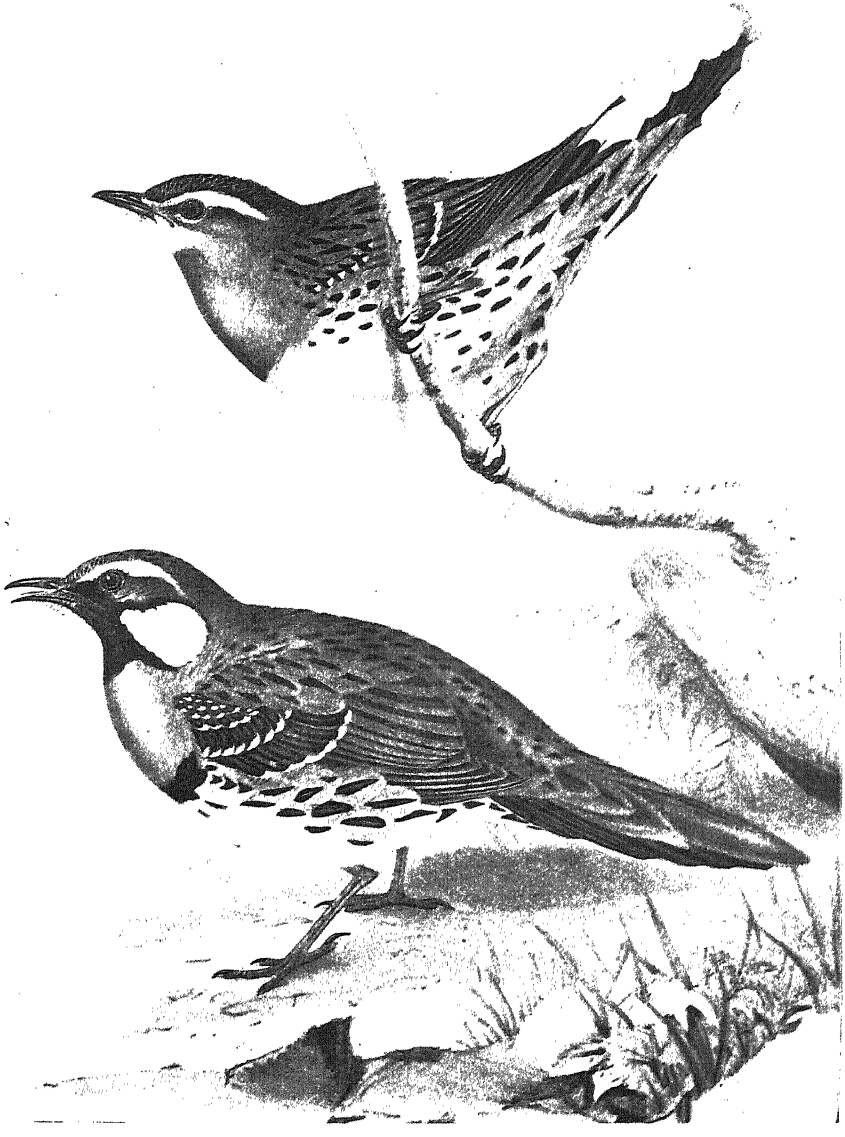
"It performs a similar service to mankind that the Ground-lark (Pipit) does on the adjacent open, and the Plover on the common beyond, all feeding on terrestrial insects and helping to maintain the balance of nature perfectly." —Hall.

"Stomachs of these birds I have examined contained the remains of various insects and their larvæ."—North.

The nest is always built on the ground, generally close to a fallen rock or stone, the base of a sapling, or in a slight depression. The eggs are usually two or three in number, but a Tasmanian observer has found clutches of four, and one of five. They are of dull white, and in rare instances of a faint creamy-white ground colour, freckled with brownish spots and blotches.

34. Mountain Thrush.

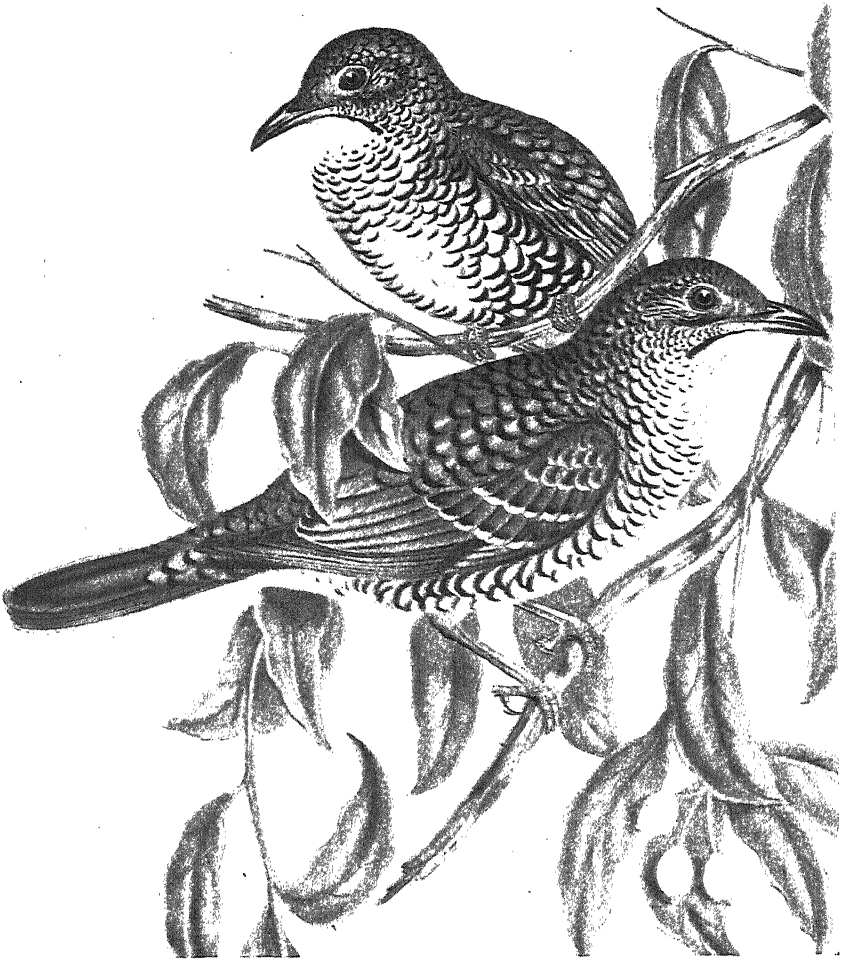
The true home of this lovable bird (as Mr. Campbell calls him) is the forest regions and coastal scrubs of South-east Australia. It frequents the neighbourhood of Sydney, and may occasionally be met with in such swampy undergrowth as that between Manly and Newport, and Mr. North records that he has also observed it throughout the south coastal districts and contiguous mountain ranges, and inland on the western slopes of the Blue Mountains. It is a modest, timid creature, and for long it was thought to



INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"SPOTTED GROUND BIRD."

Cinclosoma punctatum Latham.



INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"MOUNTAIN THRUSH."

Oreocincla lunulata, Latham.

be dumb, save for a few squeaky notes uttered when alarmed, but Mr. Campbell found that it loves to sing "betwixt the lights," after the sun has gone down. Then it may be heard in a modest, whistling song, as if to while away the interval of twilight. The music is interspersed with portions of song not unlike that of the English thrush, but without the full and impassioned notes. Sometimes it sings at dawn.

"Like most true thrushes, the Ground Thrush loves to feed upon molluscs, but is not averse to worms."—Campbell.

"The food of the Mountain Thrush is procured on the ground among fallen leaves, débris, and moss-covered logs, and consists principally of insects of various kinds, worms, land crustaceans and molluscs."—North.

Regarding the nest, Mr. Campbell remarks that a favourite situation is "about 12 feet from the ground, in the fork of an upright tree, in the centre of a thick clump or scrub," or "on a sand rise, about 20 feet above high-water mark, the nest being placed on a thick horizontal branch hidden with thick foliage; or a darkened spot where the taller tea-tree tops meeting overhead . . . . . quite subdue the light below." The nests are perfectly made and decorated, and the eggs, two or three in number, are of a bluish-green or greenish-grey, freckled or mottled with reddish or pinkish brown.

How to Kill Johnson Grass.

The problem of ridding land of Johnson grass where it has once become established, is such a difficult one, that the following by Mr. H. A. Halbert in the *San Antonio Express* (United States), in which he describes his method, will be of interest to many farmers who have been puzzled by it:—

Don't dig Johnson grass. Raise it, kill it, and leave the roots as fertiliser.

I admit that Johnson grass is twice as hard to kill, if not still harder, than most all other annuals, because Johnson grass has two methods of forming seed to perpetuate itself—one above ground, the grain, and the other below the ground, known as root stocks or rhizomas. They are called roots, but are not in the proper sense of the word a root. They have no power to gather food for themselves or for the parent stalk. The small, thread-like fibrous roots gather food from the soil exclusively, and feed these root stocks just as they do the stalk above the ground. These root stocks, or underground seed, always start at the crown, just at, or a little below, the surface, where the roots and the tops of the grass join. They are supported by the parent plant for the first few inches of growth, until they dip into the earth and send out fibrous roots of their own. Then they are independent of the parent stalk. It is always the root stocks formed, say, in 1911, that send up the grass tops in 1912. The old root stocks that formed during the year 1910, and sent up tops in 1911, have no more power to send up tops in 1912 than will a cockle-burr root that grew in 1911 have vitality to grow another top in 1912.

This being the case, we see that all that is necessary is to prevent these root stock seeds, or any of the grain seed, from forming, and the grass is destroyed. I have stated where they form—shallow, close to the surface—so the next step is, when do they form? Then can we intelligently fight the grass after knowing all its habits? These root stalks always form a certain stage of growth, and that is just as the grass bunches to bloom or to send out a seed head. Hence the two seeds above and below ground begin to form simultaneously. Knowing these facts, all the intelligent farmer has to do is to watch the growth of this grass, and shave it off with a weeding hoe or a sweep behind a horse at this critical stage, when no seed will form, and he will destroy it in a single year. It takes light but constant effort, and not the old back-breaking, ditch-digging process with a grubbing hoe, taught us by our blind leaders in authority.

Composition of Some Common Fodders.

A. A. RAMSAY, Chemists' Branch.

THE following table has been prepared in order to provide a handy reference to the composition of the more common fodders obtainable on the local market. They represent, in all cases, the fodders as sold by produce merchants, or obtained at the Government farms.

Dealing with the grains, it will be seen that peas and beans are strikingly richer in nitrogenous matter (albuminoids) than the cereals, beans being particularly rich in this respect, thus providing a very narrow ration. Oats contain a large proportion of indigestible fibre, which lowers their feeding-value considerably, though this is otherwise very high, on account chiefly of their high content of oil (ether extract).

Of the green fodders, lucerne holds the pride of place in respect to its albuminoid content, wheat containing a rather high proportion of fibre. The nutritive value of hay from different varieties of wheat is not strikingly different. The sample of Zealand from Wagga, not being as dry as the others, shows up on this account less satisfactorily. The hard varieties have the highest nitrogen or albuminoid content. The sample of oaten hay does not differ very greatly from those of wheaten hay. It is fairly rich in albuminoids. The sample of oaten chaff is, however, relatively much richer in albuminoids than the wheaten chaff, which latter provides a very "broad" ration.

All the above differences are more strikingly seen in the second table, where the results are calculated to dry substance, thus eliminating accidental differences due to the moisture-content.

TABLE I.—Showing the Composition of some Common Fodders.

	Moisture.	Albuminoids.	Ether Extract.	Nitrogen-Free Extract.	Fibre.	Ash.	Nutritive Value.	Albuminoid Ratio.
Grains—								1 to—
Wheat	13·67	8·69	·93	72·82	2·38	1·51	83·6	8·6
Barley	12·34	11·56	1·94	67·60	4·14	2·42	83·5	6·2
Oats (Algerian) ...	10·94	8·50	4·91	60·49	11·84	3·32	80·0	8·4
Peas (Grey)	14·08	19·25	1·54	58·34	4·79	2·00	81·1	3·2
Beans	13·31	26·50	1·29	51·18	5·48	2·24	80·6	2·0
Green Fodders—								
Lucerne	73·45	6·56	·40	11·12	6·20	2·27	18·5	1·8
Barley (Cape)	65·39	3·93	·31	21·38	7·43	1·56	26·0	5·6
,, (Skinless) ..	70·91	4·12	·35	14·62	7·76	2·24	19·5	3·7
Wheat (Bunyip) ...	68·36	4·37	·45	14·55	10·33	1·94	19·9	3·5
,, (Cleveland) ...	62·96	4·81	·55	17·89	11·62	2·17	23·9	3·9
Oats (Algerian) ...	69·11	3·93	·32	16·25	8·61	1·78	20·9	4·3

TABLE I.—Showing the Composition of some Common Fodders—*continued.*

	Moisture.	Albuminoids.	Ether Extract.	Nitrogen—Free Extract.	Fibre.	Ash.	Nutritive Value.	Albuminoid Ratio.
Hay—								1 to—
Wheaten Hay—								
Bobs	10·08	8·75	·92	41·83	33·16	5·26	52·6	5·0
Rymer	10·95	9·18	·90	43·19	30·20	5·58	54·3	4·9
Firbank	10·74	8·75	·72	45·01	29·70	5·08	55·3	5·3
Huguenot ...	10·34	5·62	·90	46·68	31·54	4·92	54·3	8·6
Zealand (Bathurst)	10·80	7 62	1·16	43·06	31·69	5·67	53·2	5 9
Zealand (Wagga) ..	17·70	4·92	·26	45 00	26·08	6·04	50·5	9·3
Yandilla King ...	10·70	3·97	·73	47·07	31·70	5·83	52·6	12·2
Bayah	10·38	6·75	·52	44·01	32·54	5·80	51·9	6·6
Marshall's No. 3...	14·51	6·31	·99	46·73	26·63	4·83	55·2	7·8
Federation ..	11·76	6·25	·79	47·89	28·14	5·17	55·9	7·9
Oaten Hay	11·82	8·38	1·51	39·70	33·58	5·01	51·5	5·1
Chaff—								
Wheaten Chaff ...	14·78	1·38	·74	49·81	26·23	7·06	52·9	37·3
Oaten Chaff	12·49	4·27	·90	46·03	33·17	3·14	52·8	11·3

TABLE II.—Calculated to Dry Matter.

	Albuminoids.	Ether Extract.	Nitrogen—Free Extract.	Fibre.	Ash.
Grains—					
Wheat	10·06	1·08	84·35	2·76	1·75
Barley	13·19	2·21	77·12	4·72	2·76
Oats (Algerian)	9·54	5·51	67·92	13·30	3·73
Peas (Grey)...	22·40	1·79	67·90	5·58	2·33
Beans	30·57	1·49	59·04	6·32	2·58
Green Fodders—					
Lucerne	24·70	1·50	42·40	23·35	8·05
Barley (Cape)	11·35	·89	61·83	21·43	4·50
,, (Skinless)	14·16	1·20	50·27	26·67	7·70
Wheat (Bunyip)	13·81	1·39	46·03	32·64	6·13
,, (Cleveland)	12 98	1·48	48·59	31·10	5·85
Oats (Algerian)	12·72	1·03	52·62	27·87	5·76
Hay—					
Wheaten Hay—					
Bobs	9·73	1·02	46·52	36·88	5·85
Rymer	10·31	1·01	48·50	33·91	6·27
Firbank	9·80	·80	50·44	33·27	5·69
Huguenot	6·27	1·00	52·06	35·18	5·49
Zealand (Bathurst)	8·54	1·30	48·27	35·53	6·36
Zealand (Wagga)	5·98	·32	54·67	31·69	7·34
Yandilla King	4·44	·82	52·71	35·50	6·53
Bayah	7·53	·58	49·11	36·31	6·47
Marshall's No. 3	7·38	1·16	54·66	31·15	5·65
Federation	7·08	·90	54·27	31·89	5·86
Oaten Hay	9·50	1·72	45·02	38·08	5·68
Chaff—					
Wheaten Chaff	1·62	·87	58·45	30·78	8·28
Oaten Chaff	4·88	1·03	52·60	37 90	3·59

Maize.

[Continued from Vol. XXIII, page 786.]

A. H. E. McDONALD, Inspector of Agriculture, North-west District.

MANURING THE CROP.

THE maize crop makes heavy demands upon the soil fertility, and causes exhaustion more rapidly than any other of the crops commonly grown in this State. Straw crops, such as wheat or oats, do not rapidly lessen the fertility, while other crops, notably legumes, improve the soil. If a crop be sown immediately after maize, even on normally rich land, it will be noticed that whilst growing, it lacks the rich green colour of a healthy, well nourished crop.

The capacity of the soil to meet the demands of such a gross feeder is directly manifested in the appearance of the plants. Rich, deep, alluvial soils favour rapid development of the stem and foliage, which are forced to an enormous size, while on poor, shallow land the stalks are short and the leaves small and thin. It is an adaptable plant, however, responding with bountiful yield under favourable circumstances, but yet giving a generous return even when grown under harsher conditions of soil and climate. It adapts itself more readily to different classes of soil than even wheat, which does not always yield a good crop of grain upon heavy rich soil, while maize finds its best environment in such land. Coincidentally, it is a difficult matter to over-fertilise maize. Some crops, as wheat and potatoes, if fertilised too heavily fail to respond in the way desired, but this is scarcely ever the case with maize. Wheat may produce too much straw, with the consequence that its grain yield is jeopardised, but in the case of maize the yield of grain is rarely affected by an over development of foliage. Generally the yield of grain is in direct ratio with the size of the stalk and the abundance of the leaf.

The Relation of Fallowing to Fertilisers.

Careful consideration must be given to the problem of fertilising in order to ensure an effective and economical use of the fertiliser. Disappointment is often experienced when fertilisers are employed, and they are often condemned unjustly. Manuring can only be effective when carried out in conjunction with careful cultivation. Fallowing and fertilising go hand-in-hand, and too frequently manures fail to give an adequate return through neglect in cultivation. The main requirements of the plant which it is the function of the farmer to arrange for are moisture and plant-food material. When he selects the finest land on the farm for his crop, he is arranging for the supply of the nutrients his crop requires. His plough and harrows help him to unlock the coffers of the earth. When they are partially drained he

turns to artificial sources of supply. He buys fertilisers, but overlooks the fact that in the process of cultivation something has gone from the earth besides the mere chemicals that represent plant food in the fertilisers. In the virgin land a store of humus exists, which has a wonderful capacity for retaining moisture. The process of cultivation as usually practised destroys this, so that the soil becomes infertile, and its capacity for plant production cannot be restored merely by the addition of certain powders to the soil. Old cultivated soil plus fertiliser does not equal virgin land. It is probably the amount of organic material in the new land, and not the actual amount of plant-food material, which renders that soil fertile. The old land properly fallowed and fortified by fertilisers will, however, approach very nearly to rich virgin land in crop-producing power.

Moisture is absolutely essential both to the life processes of the plant and to dissolve and carry into the cells of the plant the fertiliser added to the soil. In nearly every farming district the rainfall is insufficient for crop needs, and the deficiency can only be remedied by fallowing to conserve moisture before the crop is sown. We may take it that all soil contains a certain amount of readily available plant-food material. This, plus a certain quantity of moisture, will produce a crop of, say, 20 bushels of grain per acre. The farmer is not satisfied with such a return, and desires 30 bushels. To secure it he fertilises his land, but does not fallow to secure moisture. The result is that he still only gets 20 bushels per acre, for the simple reason that to produce 20 bushels a certain amount of moisture is required, while to produce 30 bushels a greater quantity is required, but has not been made available. Further, it cannot be expected that worn-out land will, through being fertilised, return a yield equal to new land which receives exactly the same cultivation, for, as mentioned before, the latter contains a substance—humus—which increases its power of retaining moisture.

It will be seen, therefore, that in any system of fertilising worn-out land fallowing must occupy an important place.

Humus and Fertilisers.

Chiefly on account of its power of increasing the capacity of the soil for retaining moisture, humus (decayed organic material) is an extremely important constituent of the soil. Unfortunately, however, its importance is not realised, and farming systems in this State are not devised in a way which makes for its conservation. The wheat-grower, in most cases, fires his stubble, while the maize-grower laboriously gathers his stalks into heaps and burns them. Fallowing itself tends to destroy organic material, and the system of alternate crop and fallow is rapidly reducing the fertility of the land. To maintain it a crop must be introduced into the farming system which will restore humus. In the Old Country it is effectively maintained by large periodic dressings of farmyard manure, but here that means is not open to us. Some spasmodic experiments with green crops ploughed in, made in different places, have not always been successful, but this is scarcely to be wondered at.

Humus is only the remains of organic material. Consider virgin land of a comparatively fertile character. For ages leaves, and bark, and grass, and roots have decayed on and in the land, and yet when that land is brought under cultivation a change becomes apparent in its character in a very few years. Its friable, mellow nature disappears; instead of being ploughable at any time it can only be turned up for a short time after rain, and instead of crumbling away into a good seed-bed it remains cloddy and harsh. For a time after it is brought under cultivation it is full of earthworms and grubs, which exist upon the organic material, but after a few years their source of food vanishes, and they disappear and are seen no more.

Since the accumulations of years disappear so rapidly, it is scarcely to be expected that worn-out land will be restored by one green crop ploughed in. It may and probably will have a good effect, but it cannot be expected to make the soil like virgin land.

Humus is of vast importance to the maize-grower, and he should conserve it by introducing into the farming system a crop which will enrich the soil in this respect. It is difficult to do this where only maize is raised and the grain is sold off the farm, but it is very doubtful if the maize-grower is following the most profitable course in doing this. It is very probable that the grain could be used to greater profit by converting it into pork or bacon. One of the best crops for improving the soil is cowpeas. Besides producing much leaf and possessing spreading roots which open up the subsoil, the plant draws nitrogen from the atmosphere and adds this valuable substance to the soil. In addition to these virtues, it is a wonderfully valuable plant for the pasturing of pigs. Being rich in protein, it is unequalled for building up the young growing animal. It is specially fitted to serve as a rotation crop with maize, as it thrives well wherever that crop grows, and being a summer crop ample time is left after the maize is harvested to prepare the land for the cowpeas, the crop of which can be taken off in good time to allow the land to be again prepared for maize. Such a rotation maintains soil fertility. It is a comparatively simple matter to keep land in good heart when a crop is included in the farming system which restores any loss of humus that takes place in the process of cultivation, but when the land is allowed to become worn out through neglect it is a difficult matter to bring back its fertility.

Fertilisers to Use.

The adoption of a system of fallowing and crop rotation creates in the soil a receptive condition for the chemical fertilisers which are indispensable to the good farmer. Every crop removes from the land a certain quantity of substances, and it has been proved by science and practice that it is only by restoring at least a portion of these substances in the form known as artificial fertilisers that maximum yields can be obtained. The crop is a medium of turning certain raw materials into a product of value to man, just as the mill is a medium for turning grain into flour, and to the crop, quite as much as to the mill, the raw material must be supplied. The fertilising of a crop is,

however, a much more complex matter than the feeding of grain to the mill. What fertilisers must be used, and how much, depends upon the character of the soil, the variety of crop, how the crop is to be used—whether as grain or as fodder—the time at which the crop is grown, the climate, &c.

Good results may be obtained by using a complete fertiliser, but it should be the aim of the farmer to ascertain just what fertilisers should be applied, and what quantities are to be used. A farmer must, in fact, make experiments for himself, for conditions vary so much, even on neighbouring farms, as to necessitate different methods of fertilising.

The fertilising substances which are required by a crop are lime, nitrogen, phosphoric acid, and potash. Whether the first-named is required can be determined without difficulty by analysis. The determination of whether the last three are required is not so easy. It can only be settled by experimentation; the crop must be asked to settle the question.

Experiments with Various Fertilisers.

A simple set of experiments has been devised by the Department of Agriculture to ascertain for farmers what fertilisers they should use, for a farmer may pay away a large sum annually for a particular kind of fertiliser which he can very well do without. The value of experiments such as these, which can be conducted with very little trouble, is very evident. For instance, a farmer may be using and getting good results from a complete fertiliser, whereas he could get equally as good results from a fertiliser that would not cost him half as much.

The set of experiments at present in progress will enable the effects of the following fertilisers to be compared:—

(1) Superphosphate, 2 cwt. per acre.
(2) Superphosphate, 1 cwt. per acre.
(3) No manure.
(4) Superphosphate, 1 cwt.; sulphate of potash, 28 lb. per acre.
(5) Superphosphate, 1 cwt.; sulphate of ammonia, 56 lb. per acre.
(6) Superphosphate, 4 parts; bone-dust, 2 parts; dried blood, 3 parts; sulphate of potash, 1 part; to be applied at the rate of 1½ cwt. per acre.

Until it has been determined by experiment exactly what fertiliser is required, a complete fertiliser should be used. By a complete fertiliser is meant one which supplies nitrogen, phosphoric acid, and potash. Such a fertiliser places the farmer on the safe side. A very useful mixture, which has been thoroughly tested, is that shown above as No. 6. It contains the following percentages of the essential elements:—Nitrogen, 4 per cent.; phosphoric acid, 11 per cent.; potash, 5 per cent. An application of 1½ cwt. of the mixture would provide 7 lb. nitrogen, 18 lb. phosphoric acid, and 8¾ lb. potash. Approximately it will cost about 10s. 6d. per acre.

This mixture was carefully devised by Mr. Guthrie, Chemist of the Agricultural Department, and has stood the test of time. The ingredients are so

compounded that a proportion is at once available, and encourages the germination of the seed and the initial growth of the young plants, while a proportion becomes available as the plant grows, and provides a constant source of nourishment. It is noticeable that this mixture produces a healthy growth, and the plants withstand spells of hot weather better than when more forcing fertilisers are applied. Any farmer can make up the mixture after obtaining the ingredients from the manure merchant, or if he does not care to go to the trouble of making it up himself, can have it prepared by the merchant.

Where the compounding is done by the farmer, he should carefully sieve out all hard lumps and pulverise them, and then mix the ingredients thoroughly. The mixing can be done quickly and thoroughly by shovelling.

Fertilisers should be applied with the combined seed and fertiliser drill. The drill deposits the fertiliser and seed in close proximity, and it appears from frequent observations that this is of great advantage to the young plant. When the fertiliser is sown broadcast, or even by hand along the drills, it does not promote growth as it does when drilled in.

Superfetation.

A case of an extraordinary nature was reported to the Stock Branch by Mr. G. M. McDonald, Runnymede, Casino, on the 29th January, 1913. Mr. McDonald wrote :—

There was a cow, half-bred Jersey and Durham, owned by Mr. H. Turner, of Fairlight, at Casino, which calved a bull calf (a fine, strong calf) in November, and after milking for about four weeks the cow was going dry, and seemed to be again heavy in calf. Mr. Turner turned her out, and she again calved a strong bull calf on 1st January, or about seven weeks after the first calf. She is now milking well. It is the first time I have ever met with a case of this kind, and I thought it might be of interest to you. I would like to hear your opinion of the double-calving.

The case was of such interest that careful search was made in the literature in the Veterinary Branch to discover a parallel, if possible. Only one other case of the kind could be found on record. In "Veterinary Obstetrics," by George Fleming, F.R.C.V.S., page 154, appears the following :—

One of the most recent cases [of superfetation] is reported from the United States of America.

On 20th February, 1876, a five-year-old mare belonging to William Driesbach, of Sparta, N.Y., foaled a dead colt, fully developed, and otherwise promising in those points which go to make up a good horse. The mare appeared to be well, and to the surprise of her owner, on the 2nd April following, six weeks after the birth of her foal, gave birth to another colt, which was sound, healthy, well developed, and in all respects as promising a colt as could be found in the State.

—S. T. D. Symons.

The Vine in Australia.

[Continued from page 71.]

M. BLUNNO, Viticultural Expert.

Tending the Vines—the First Year.

As the spring advances the rootlings or cuttings will shoot and slowly grow; if there be no lack of moisture in the ground and growing weather keeps on through the spring, the young shoots, of which there will be two or three, may, by the end of the season, attain a height of 3 or 4 feet, as in Fig. 1. When they have attained a length of 12 inches or so, they are tied to a stake to prevent the wind from breaking them off. The ground is kept well scarified all through the spring and summer; if the soil is dry and there be the possibility of watering the young vines, or at least those more backward, it is well to do so; furthermore, the young shoots should be sprayed with Bordeaux mixture and dusted with sulphur against oïdium, and if caterpillars (vine moth) make their appearance, then the shoots should be sprayed with arsenate of lead. The spring or the summer may be rainy, when weeds growing round the young plants would hamper and smother the growth of those which are making slow progress. The tender shoots struggling among the weeds in the damp atmosphere, which such weeds keep around them, would be more easily affected by black spot and other fungoid diseases, which would check their further growth, if not kill the young plant altogether. If the Rutherglen bug (*Nysius vinitor*) is likely to appear in the district, as this pest finds its harbour among weeds green or dry, it is not sufficient to cut them down, but they must be ploughed in; and if the bugs have already made their appearance, then a solution of tobacco stalks and soap should be sprayed on the young shoots.

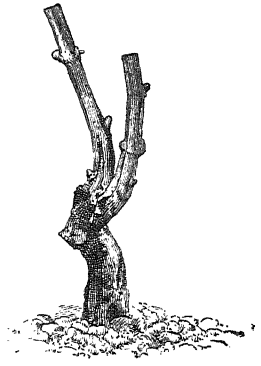


Fig. 2.

The First-year Pruning.

The two canes which have been allowed to grow during the previous season are each now cut back to two eyes, as in Fig. 2. All the four shoots from the four buds are allowed to grow, while any others coming from a water sprout or from the crown are rubbed off. The shoots are tied upright and cared for as in the previous year.

Second-year Pruning.

The vine is now in its third year from planting, and will bear a small crop, so it must be given a shape, according to the system of pruning which it is desired to adopt.

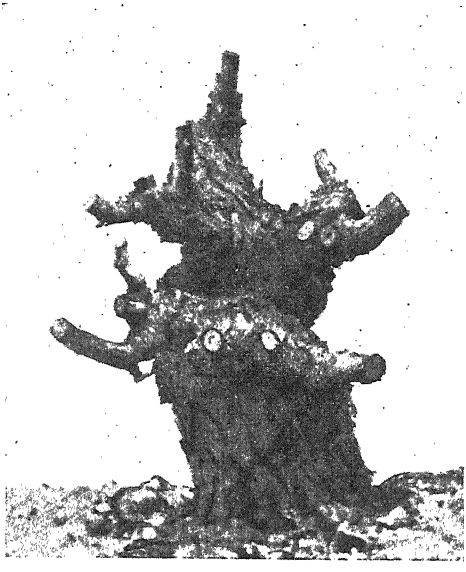


Fig. 3.

after nine or ten years, when the stem and branches will grow thicker. In the meantime the appearance of the vine will be more like that in Fig. 3 because for the first few years the various branches will branch off at different points of the stem; but as trunk and branches grow in thickness, the starting off of the latter will come closer and closer till they merge, and the appearance of the vine will be like a candelabra, as in Fig. 4. The French call this system *gobelet*, viz., wine cup, because the branches, starting from the same point of the stem, and forming an angle with the

Gooseberry-bush System of Spur-pruning.

The vine being in its third year, has four canes. Three of these canes are cut back to two buds, and the fourth cane is cut clean off. Thus the vine is provided with three spurs, each carrying two eyes, not including the small eyes round the crown. Shoots will grow also from the crown, and a shoot from the crown may be utilised to form a new branch. It must be borne in mind that the typical shape of the vine formed after this method is that of a candelabra, viz., a branch of candlestick, each branch carrying one or two spurs. Naturally this shape can only be obtained

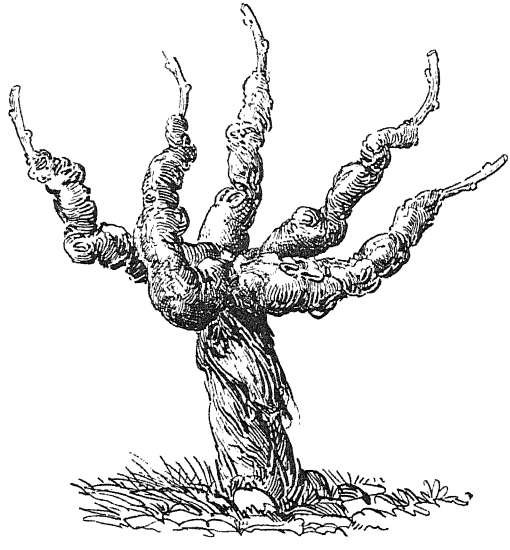


Fig. 4.

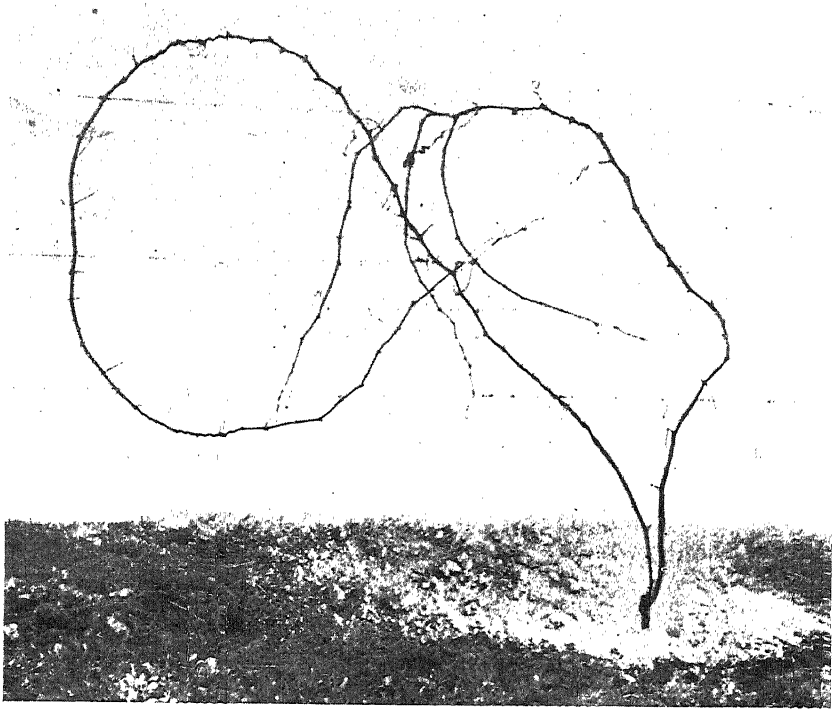


Fig. 1.

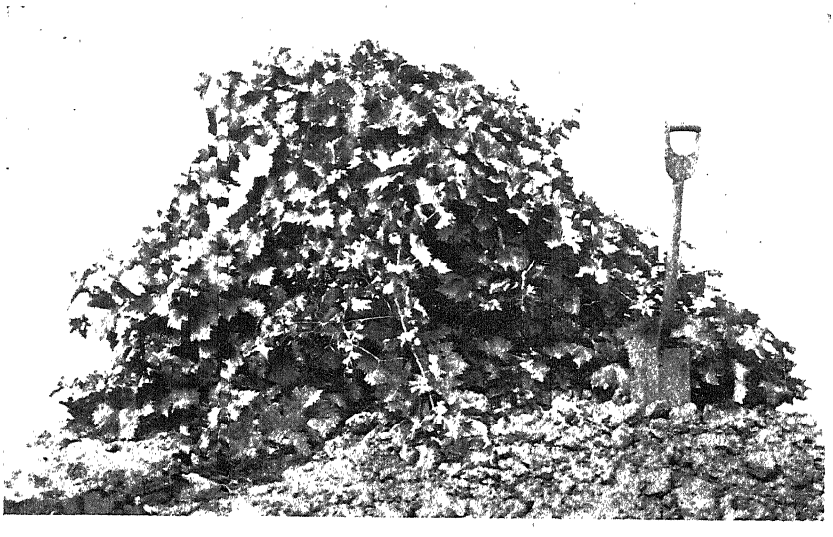


Fig. 5.

PRUNING THE VINE.



Fig. 6

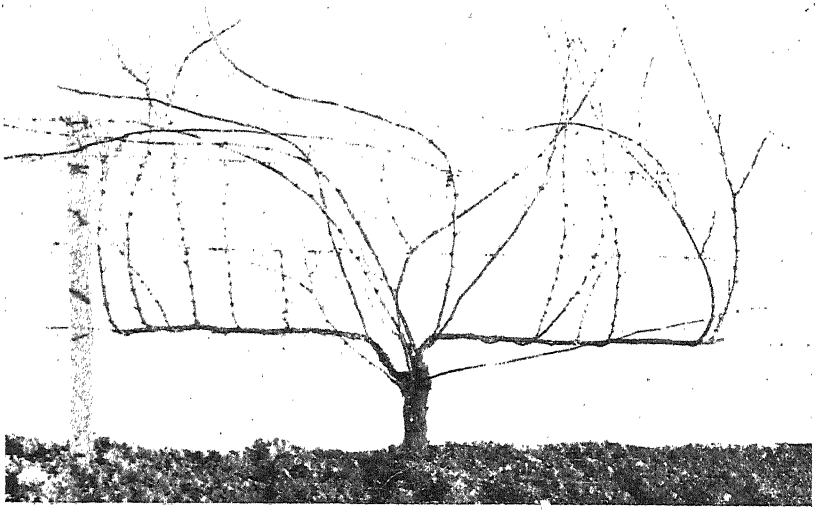


Fig. 7.

PRUNING THE VINE.

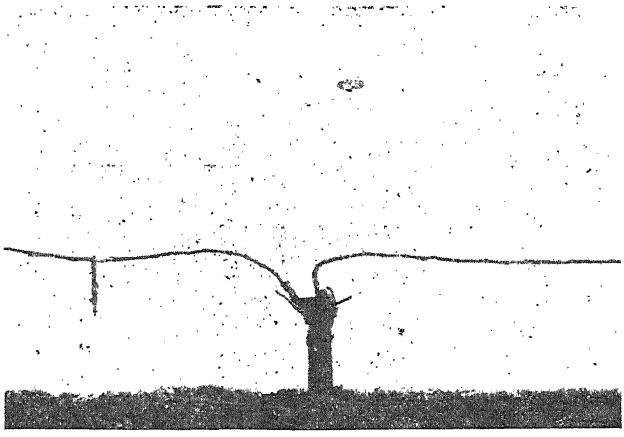


Fig. 8.

stem, give the vine the appearance of a cup. No branch must be allowed to grow inside. The Italians call it *alberello*, or small tree; similarly, in a well-pruned tree, no branches are allowed to grow inside. The right height of the stem over the ground in this method is about 10 to 12 inches. If the



Fig. 9.

stem be shorter the grapes then touch or lie on the ground. If the district is not subject to heavy rain in summer, the grapes will still keep sound, while the leaves will shelter almost all of them from the sun. I have seen at Siderno and Stilo (Calabria, Italy), many vineyards of Zibibbo, a kind of

White Muscat, where the vines, pruned on spurs, had very short stems; the canes were allowed to trail on the ground, and the vines being closely planted, the whole area was covered with foliage, the bunches being all hidden by it, and in many cases resting on the ground. Calabria is a very hot country in summer, and the season is usually rainless.

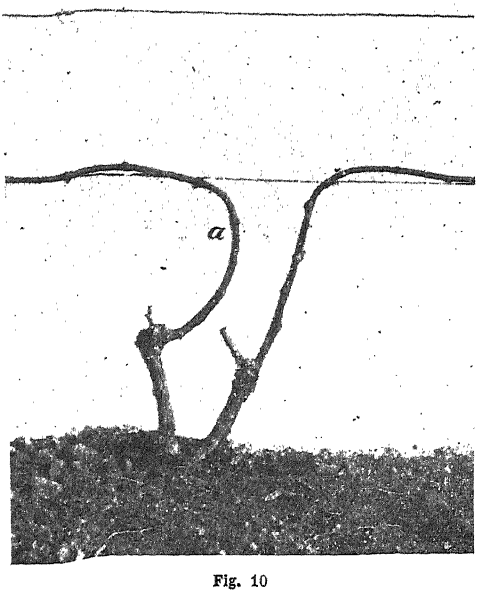


Fig. 10

While the vines, trained on the gooseberry-bush system, are young, they require a stake on to which the shoots are tied; but when the plants grow strong, the stake can be dispensed with, and to prevent the canes from trailing on the ground, they are, when still green, twisted in a knot at the top (see Fig. 5). This may be possible where the vines are closely planted, and where, therefore, each individual plant does not attain large dimensions; but in Australia, the vines being planted wider apart, each plant grows far more canes; hence, in many cases, we find that a stake is still kept to support even fully-developed plants.

Guyot's Single System of Pruning.

Guyot's system (single) consists of one rod carrying from eight to ten buds, which is bent and laid along a wire; beside this rod, a spur is also left, carrying two eyes free of the crown.

In the foregoing I said that the vine at the time of its second pruning would have four canes. To initiate the Guyot system, the two lower canes are cut off; of the two others the highest is left long and bent along the wire; the lower is cut back as spur with two eyes.

The Double Guyot.

Under this system, instead of one rod and one spur, two rods and two spurs are left. The two rods are laid on the wire running in opposite directions.

There are certain details in the Guyot method of pruning which must not be disregarded in order to always keep the vine in shape. First of all, it is necessary to have the spur always 2 or 3 inches at least lower than the bearing cane. The bending of the cane will check the sap, and a checked sap reaches the shoots in a better state of elaboration, and will also prevent them from growing too much foliage, with loss of fruit; at the same time, if



Fig. 11

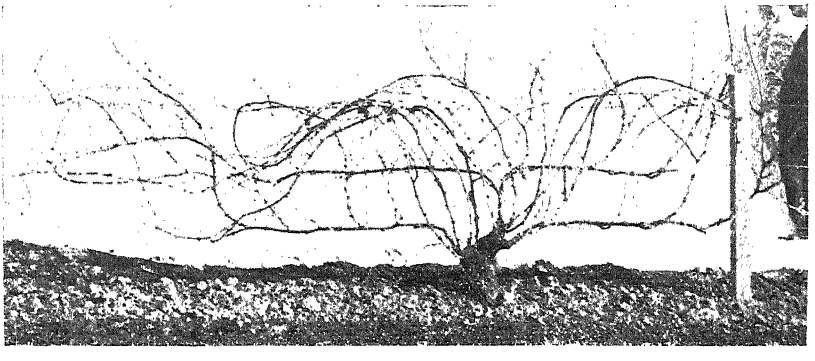


Fig. 12.

PRUNING THE VINE.



Fig. 14.

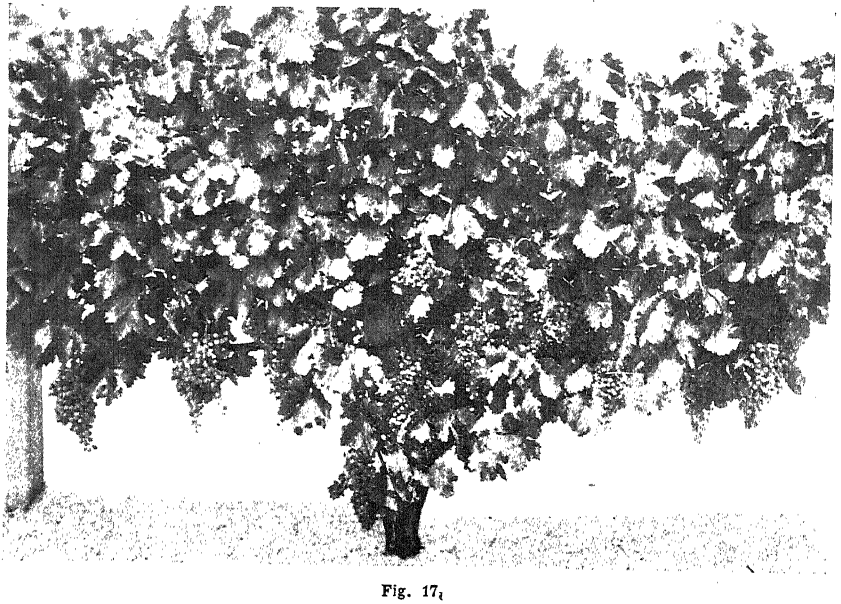


Fig. 17.

PRUNING THE VINE.

two or three shoots are allowed to grow before the bend (that is, on the free run of the sap) these shoots will act as robbers, and very little sap will reach those on the horizontal portion of the rod, which may thus either grow poorly or some of them may never grow at all (see Fig. 6).

In Fig. 7 is represented a vine on the Guyot system that has not yet been pruned, while Fig. 8 represents the same vine, and Fig. 9 shows it with the crop.

The Guyot system of pruning, whether single or double, is the simpler method of trellised vines; the crop-bearing rods being laid on to and tied to a wire. Pruning on the Guyot system consists of three cuts: First, by the cutting off of the horizontal branch which has borne fruit we cut off the past; second, the cutting back to suitable length of the cane which is to be laid on the wire represents the bearing cane for the year, therefore this is the pruning that provides for the present; and, third, the cutting back of

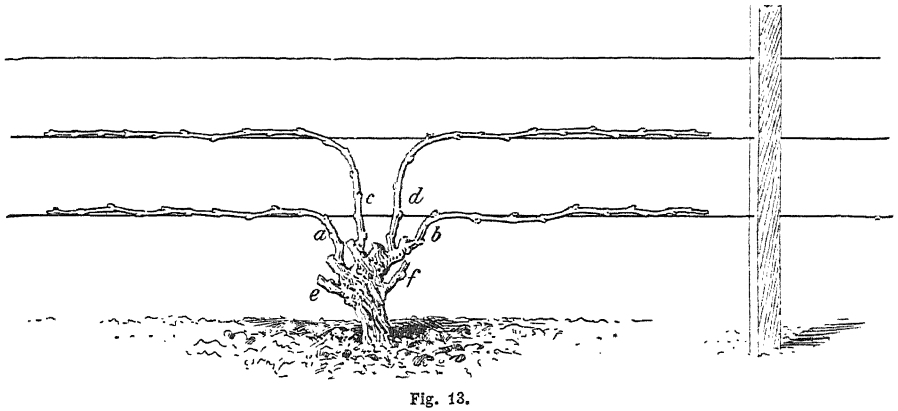


Fig. 13.
a, *b*, *c*, *d*, bearing canes; *e*, *f*, spurs.

one cane to a spur, from which two vigorous canes are expected, and on which will be made the pruning in the following year, the cutting of this cane is the pruning to provide for the future.

Fig. 10 and Fig. 11 represent a system of pruning rather close to the Guyot, and is in vogue in several European districts. Several vines are thus pruned at the Viticultural Station at Howlong.

There are vines which, especially if planted wide apart, and in rich soil, and more so if they are grafted on phylloxera-resistant stocks, grow so very vigorously that not even the adoption of the double Guyot system can abate their vigour, which shows itself in an abundant growth of wood and foliage, and much less fruit. In such case the best plan is to give the vine more to do by leaving three and four long rods; in this wise the vegetative vigour will be attenuated, and the yield increased. Fig. 12 shows the vine unpruned, Fig. 13 the same vine after pruning, and Fig. 14 the vine with the crop.

The trellis work requires three wires, but two wires only can be made to do, as it is generally done in this State where vines are trained on trellises.

The bottom wire is usually 18 to 20 inches from the ground, and the second 16 inches from it. The rod is laid on and tied to the bottom wire, and all shoots are tied to the top wire. Straining posts are put at both ends of the row, and intermediate stakes at intervals of about 16 feet. To reduce expense the number of full-length stakes may be reduced by one-half, using alternately half stakes and full-length ones. The half-stakes are made to reach the bottom wire, the wire being run either through holes driven into the stake, or resting on top of it, and kept in position by a V-shaped nail, as in Fig. 15.

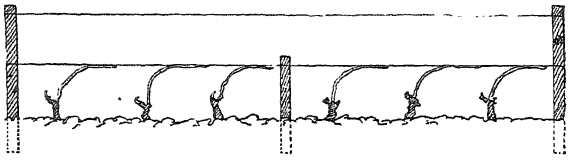


Fig. 15.

All shoots should be tied to the top wire, to prevent them from being blown and broken off by strong winds. This involves a good deal of labour, and in the old country it is done by women and children; but in Australia, in the majority of cases, shoots are not tied, being allowed to fasten themselves to the top wire by their tendrils.

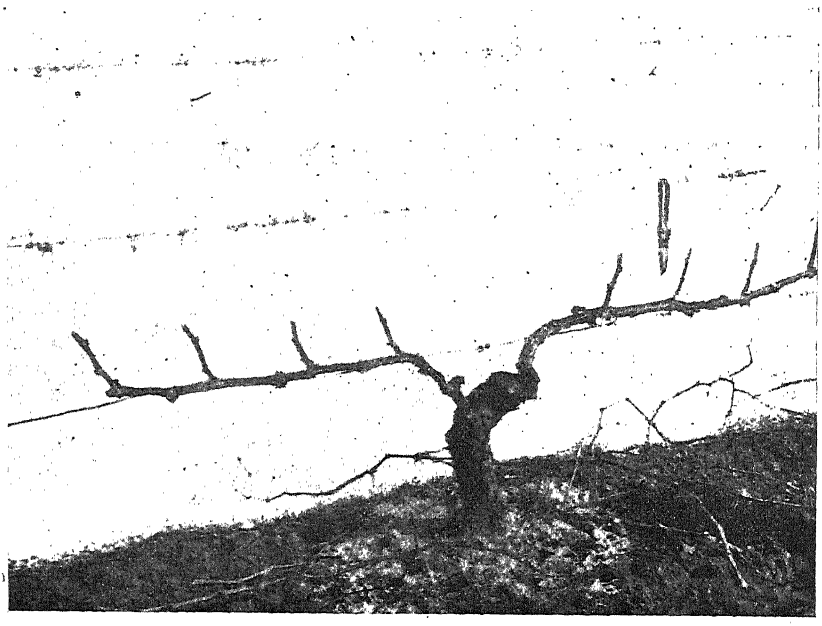


Fig. 16.

Horizontal Cordons.

The horizontal cordons are also trained on wire. This system cannot be called "long pruning," because the cordons carry spurs, not long canes. To

form the cordons, the grower makes a start on the third year, by bending a cane on the wire; the bend must be fairly sharp in order to have a well-shaped cordon vine. Having bent the cane, all the buds before the bend, which are on the vertical portion of the cane, are removed; then every bud on the horizontal part of the cane which looks towards the ground is also removed, and only those which are turned skyward are left. From these eyes shoots will grow, which are tied to the top wire, so for the first year of the formation of the cordon we have a sort of Guyot system, minus the side spur. The following winter all these canes that have grown on the horizontal cordon are cut back to two-eyes spurs: thus we have the real cordon. The system is also called "permanent cordons," because the horizontal part is not renewed every year. From each

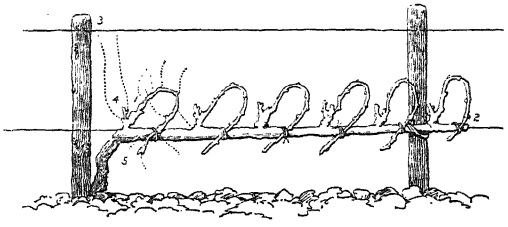


Fig. 18.

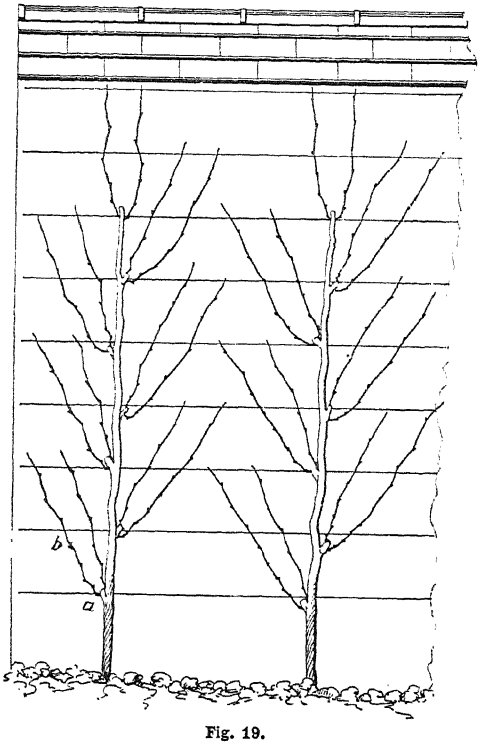


Fig. 19.

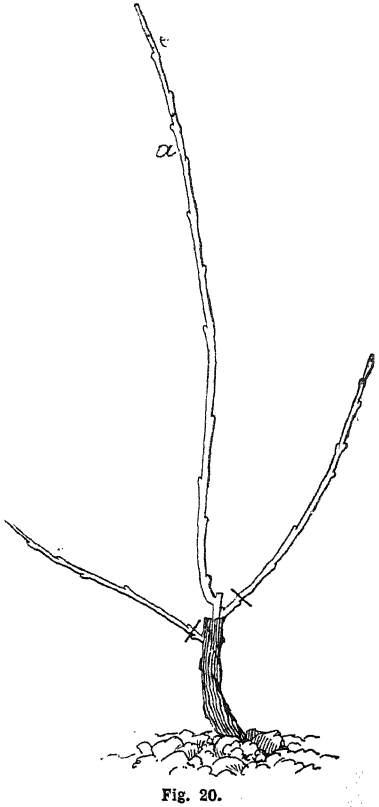


Fig. 20.

spur two canes are obtained, and the following winter the lower cane is cut back to a spur, and the old spur and the other cane are cut clean off, and so on year after year, on the principles illustrated in Fig. 16. Fig. 17 shows the crop. This system is identical with that about which so many eulogies were made recently in French viticultural journals, and called the "Taille de Quarante," but it is an old system, and there is nothing new about it, only the latter is on a one-armed cordon.



Fig. 21.

Cordon Cazenave-Marcon.

Another method of pruning which gives about the largest yield, is the Cordon Cazenave-Marcon. It is a horizontal cordon like that above described, but with each spur there is also a small long cane which is bent in a half-circle, and the end tied to the cordon itself. To shape the vine after this method, it is necessary to form first the ordinary horizontal cordon as described in the foregoing. Of the two canes grown on the spur the lower cane is cut back to two eyes, and thus a new spur is obtained, and the top cane is cut to carry from six to eight buds, and this short rod is then bent and tied to the cordon. In Fig. 18 the canes numbered 1 and 2 represent the long rods, that numbered 3 represents the shoots from the spur numbered 4, and 5 indicates the shoots from the long rod.

Two Other Systems.

The four systems already described are the principal ones for growing wine-grapes and table grapes as well; they are quite typical, and all others are more or less a variation of one of them. Yet I would mention two other systems much adopted for the table grapes, viz., the vertical cordons and the Palmette system, which are usually adopted when vines are planted close to a wall or in a garden.

Vertical Cordons.—The vine stem is vertical in the vertical cordons, and carries spurs at intervals. The height of the stem varies from 5 to 6 feet, and it is fastened to wires as in Fig. 19, where the *a* represents the spur, and *b* the cane grown from it.

Palmette.—The Palmette system consists in shaping the vine like a fan. This is the way to proceed: At the second pruning we suppose the vine having three canes as in Fig. 20. The two lower canes are cut back to two eyes, and the central cane A is bent towards the ground. The eyes of the main rods and of the spurs will produce shoots as seen in Fig. 21, but towards the end of the summer the long rod is gently brought to a vertical position (see Fig. 22). The shoots *a* are then arranged so as to take an even and parallel direction among themselves, and at the third pruning these lateral canes are cut to five or six eyes, at the same time bending the rods slightly towards the ground as in Fig. 23. The end rod *b* is similarly bent, but about the end of summer is gradually set back upright to prolong the branch *c* if the palmette is wanted to reach a greater height.

It is evident that both systems of "vertical cordons" and "palmette" require wires. The number of wires will depend on the dimensions it is intended to give the vines.



Fig. 22.

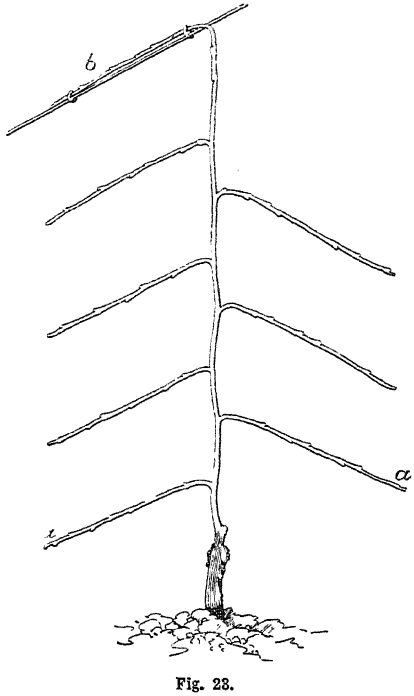


Fig. 23.

Apple-growing at Mount Irvine.

W. J. ALLEN.

For some years past Mr. Charles P. Scrivener, of Kookootonga, Mount Irvine, has been making careful observation of the way in which his apples have cropped, and he has come to the conclusion that only two, or, at most, three, rows of any one variety should be planted side by side. He has observed, for instance, that where rows of Jonathans and Sturmer Pippins are next to one another, the trees have for years carried good crops of fruit, while Jonathans which are separated by another row of Jonathans from a different variety, have hardly done so well, and those separated by two or more rows from the different varieties have borne only medium to indifferent crops. The peculiarity has been particularly noticeable this year, and during the last few days I have had an opportunity of inspecting the trees, and am quite satisfied that, for the Mount Irvine district at least, it is unwise to plant more than two or three rows of any one variety together.

There is no doubt in my mind that the trees have gained by interpollination. Those trees that are adjoining other varieties which flowered at the same time are simply breaking down with the weight of fruit, so heavily are they laden, but after passing the third row, particularly in a block of Sturmers, the crop in nearly every case was a very ordinary one, and not more than a third of that on the trees nearer the other varieties.

Those who are planting trees would do well to take notice of this fact of inter-planting varieties that bloom at the same time. If Jonathans are to be the main variety, there should be two or three rows of them, and then one of, say, Granny Smith, or any other variety that blooms at the same time, and beyond it again, a further two or three rows of Jonathans.

The subject of interpollination has been attracting considerable attention in American apple-growing districts during recent years, and though the results are somewhat variable, as to both districts and varieties, the practice of planting large blocks of one variety is not followed now, blocks consisting of two or three rows of alternating varieties being preferred.

How to Send Specimens for Examination.

Specimens of leaves and fruit affected by any disease should not be packed in wet grass or weeds, because these carry with them minute forms of life which often make the examination difficult. It is advisable to pack all such specimens between sheets of blotting paper.—Bureau of Microbiology.

Cicadas as Pests.

Melampsalta incepta, Walk.

WALTER W. FROGGATT, F.L.S., Government Entomologist.

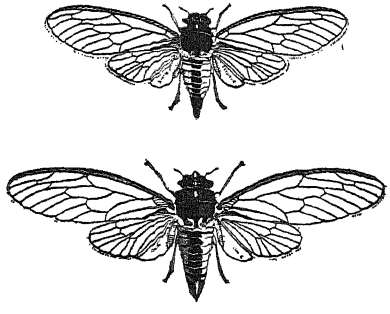
THE early part of November every summer is distinguished from other seasons of the year by the advent of cicadas, which are only too well known in the suburbs of Sydney by their incessant screeching from early morn till late at night. Every third year we seem to have a superabundance of them, which would suggest that the cycle of their development from the egg to the adult insect takes about three years in most of our large species.

This season (1912) we have a record in all parts of the State; the cicadas have been reported to be extremely abundant, and several of the smaller squeakers have appeared along the coast in countless thousands. Though cicadas are more or less common in most parts of the tropical and semi-tropical world, there are very few records in natural history works of their doing any damage to trees or shrubs in their perfect adult state. In all stages of their life, they are furnished with a powerful, jointed, tubular, horny, sucking mouth; and in the active larval state, when crawling about underground among the roots, they live upon the rising sap of the tree; so that when they are swarming in large numbers upon the roots, as they must be from the numbers of perfect insects that afterwards emerge, they must divert a large amount of sap from its righful channel.

The only noticeable damage that cicadas are credited with is the dying back of twigs of fig trees, caused by the female cicada slitting the bark and depositing her eggs in two parallel rows in the sapwood. We find many instances of this in the orchards in the neighbourhood of Sydney, frequently upon apple trees. Men, when pruning, often find the scarred branchlets looking as if they had previously been infested with woolly blight. This damage was very noticeable about ten years ago around the Camden Park orchards.

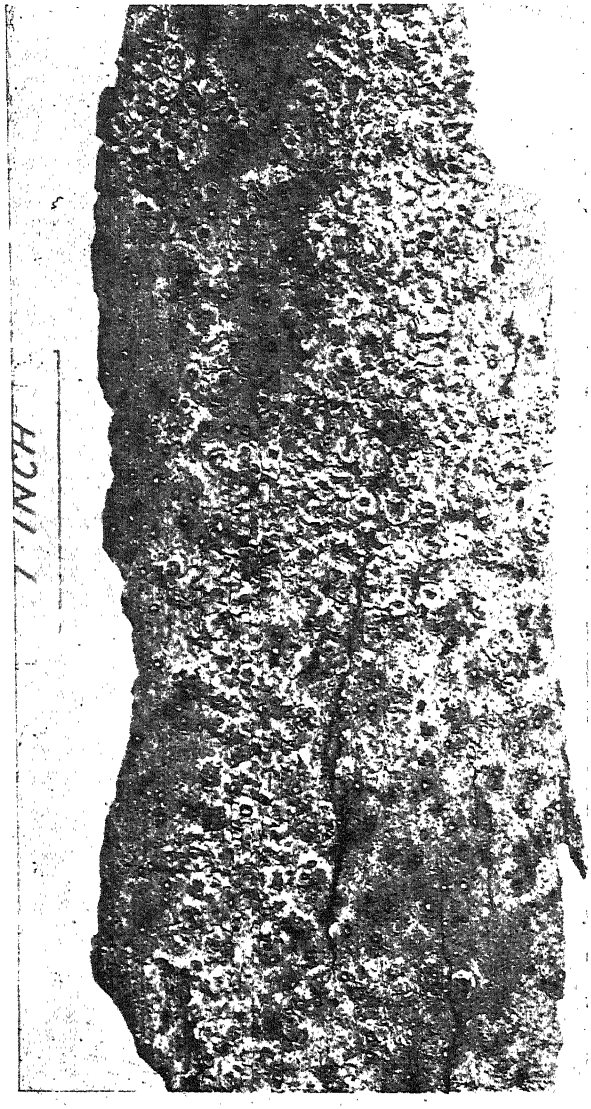
This year we find cicadas starting out in a new rôle as insects damaging the bark of fruit trees.

In the genus *Melampsalta* are several allied groups of small black cicadas which are popularly known as "Squeakers," from the different sounds they make compared with the large species. They are common along the coast in scrub and forest land, and a number of them probably develop underground on the roots of the common wattles.



Melampsalta incepta—**Male above, Female below.**

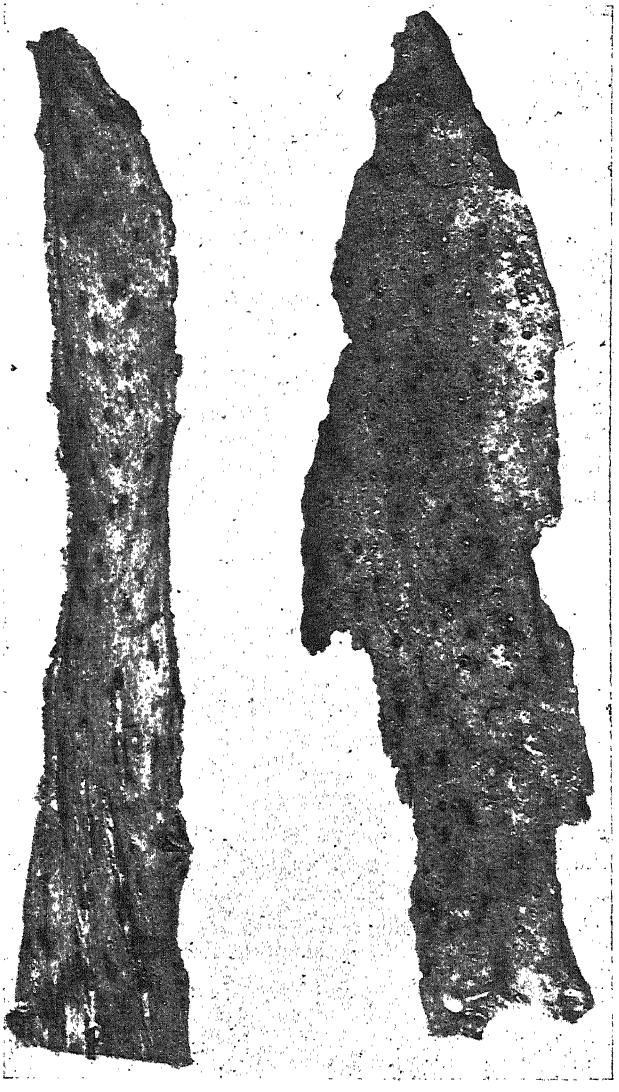
Early in November, Inspector Nicholson reported that several orchards in the Penrith district had been infested with a small black cicada in such swarms that they had completely covered many peach trees; and by puncturing the bark of the trunk and branches had caused them to gum all over, thus doing serious damage to the trees. I visited Kingswood with Inspector Nicholson, and met Mr. A. Randall, whose orchard was one of the first attacked; and though the cicadas had departed, there could be no question as to the damage they had done to the bark of the peach trees. The whole of the trunk and the main branches of dozens of peaches were covered with little globules of dried gum that had exuded from the tiny punctures made by the rostrum, or sucking mouth, of the cicadas. Under a square inch of bark removed from a badly infested branch, I counted forty-five punctures through the bark into the sapwood beneath, and this was a fair average of the condition of many feet of the trunk and branches of a number of trees in this orchard.



Peach bark punctured by cicadas.

The cicadas swarmed into the orchard on the 7th November, and remained in swarms for about ten days. At the time of my visit, the 21st November,

there was only an odd insect here and there in the trees. Specimens captured proved on examination to be the common wattle cicada (*Melampsalta incepta*, Walker).



Eucalyptus bark punctured by cicadas.

On the 26th October, Mr. W. J. Morson forwarded several specimens from Dapto on the South Coast, stating that there were thousands of black "flies" swarming over his fruit trees, and in answer to my request for more samples,

he sent me a few days later over a hundred specimens he had collected in the morning. He did not notice any damage caused by them among his trees, though it was the same species of cicada as at Kingswood.

In consequence of notices appearing in the newspapers about the end of last October that an insect pest was killing the gum trees in the Richmond River district beyond Lismore, I made inquiries and, through my valued correspondent, Mr. T. W. Hewett, of the *Northern Star*, received a number of specimens of damaged gum-tree foliage, twigs, and bark. The bark showed many punctures, probably caused by the beaks of the cicadas, a number of which were also sent in the package. Careful examination of the material showed that a great deal of damage to the foliage and twigs had been caused by some moth caterpillars which had departed, and no specimens remained that could be identified.

The interesting facts regarding the cicadas, as furnished by Mr. Hewett, are as follows:—"About three weeks ago, they (the cicadas) were here in swarms. When they were disturbed from the trunks of the tree, they rose like a swarm of bees, and people riding or driving through the parts of the district where they were suffered a lot of annoyance. A week after they were here, the gum trees all looked as if they had been rung, as the leaves all died on the young branches. Many people still aver that the trees are dead, but I have been looking at some on my place and am sure they will recover.

"By the same mail I am sending you a few insects, also some twigs and bark. Possibly the microscope might reveal something. I expect all the leaves will be dead when they reach you, but you will be able to distinguish those that were dead from the action of the locusts. You will notice the bark is all covered with minute spots. These are the punctures made by the insects. I notice a great deal of the old bark died and is dropping off, and the new bark is showing. In the parts of the district where the insects appeared, scores and scores of the gum trees (no others) look dry and dead. I also remember seeing a small fig tree stripped bare."

The black wattle cicada, *Melampsalta incepta*, was described by Walker from South Australia in 1850, but it has a very extended range right round the coast, through Victoria and New South Wales into Southern Queensland. Mr. C. French, junr., Government Entomologist, Victoria, informs me that it was very plentiful in several localities near Melbourne this season.

It is the typical form of this group, rather slender, and of a uniform black colour, with the face, back, sides, and under surface of the body red, except the extreme tip. The wings are transparent, with the nervures red and brown. It is somewhat variable in size, the body measuring slightly over half an inch in length, and across the expanded wings about 7½ inches.

Analyses of New South Wales Wines.

[Continued from page 60.]

F. B. GUTHRIE AND A. L. MUSSO.

SERIES IV.

THE table on page 346 gives the results of the analyses of twelve samples of wine, the produce of a vineyard in the county of Cumberland.

From the table it appears that the twelve samples in question taken as a whole may be considered good wines, well fermented, and with little volatile acidity. This is no higher in the older than in the younger wines.

The proportion of extract as well as of ash is particularly good in all of them.

The high percentage of fixed acids, while it does not impair their taste, should ensure their good keeping and perfect maturing under ordinary care.

It will be noted that in all cases where the tartaric acid (free) is high the quantity of volatile acids is comparatively low.

BURNING LIMESTONE IN THE OPEN.

LIMESTONE can be burnt in the open without the expense of building a kiln. If the process is to be a continuous one it will be necessary to have a specially constructed kiln, but if small quantities are to be burnt at a time, there is no reason why they should not be burnt in the open by mixing broken limestone with the wood, or placing them in alternate layers. About 1 ton of wood would be required to 2 tons of limestone.—F. B. GUTHRIE, Chemist.

On the same subject the Public Works Department wrote recently:—The General Manager of the State Brick and Lime Works reports that on one occasion, when he was erecting a building in the country, there was a large quantity of limestone near the work, but no kiln within a considerable distance. He excavated about 10 feet into the bank, thus making the sides of the excavation act as three sides of a kiln, and then laid about 18 inches of timber on the bottom, with 18 inches of limestone on top, and added layers in the same way till the excavation was filled. Then he lighted the timber at the bottom, and the fire burnt through the lot. The experiment was a success, and the manager unhesitatingly states that the lime so produced was quite good enough for agricultural purposes.

TABLE IV.—ANALYSES OF NEW SOUTH WALES WINES.—SERIES IV.

	Specific Gravity.	Alcohol Absolute per cent. by Volume.	Percentage of Proof Spirit.	Total Acids as Tartaric.	Fixed Acids as Acetic.	Volatile Acids as Acetic.	Extract.	Ash.	Sugar.	Tannin.	Potash as Bitartrate.	Total Tartaric Acid.	Tartaric Acid (free).
1911—A and B Riesling	0·9922	12·05	21·11	0·82	0·74	0·065	2·27	0·184	nil	0·0016	0·253	0·363	0·161
1911—F Verdot and Hermitage ...	0·9959	11·00	19·27	0·69	0·61	0·070	2·85	0·374	trace	0·179	0·181	0·201	0·057
1911—E Hermitage	0·9961	11·26	19·73	0·70	0·60	0·077	2·53	0·336	trace	0·160	0·189	0·207	0·056
1912—Riesling	0·9902	13·24	23·21	0·68	0·62	0·051	2·16	0·183	0·21	0·003	0·166	0·309	0·176
1912—Cabernet	0·9955	11·52	20·19	0·66	0·58	0·065	2·98	0·391	0·102	0·168	0·242	0·160	nil
1912—G Verdot and Hermitage ...	0·9945	11·79	20·65	0·70	0·60	0·080	2·84	0·357	0·114	0·153	0·231	0·184	nil
1912—White Shiraz Jubilee... ...	0·9911	12·05	21·11	0·68	0·62	0·047	2·25	0·166	0·36	trace	0·223	0·286	0·107
1912—B Hermitage	0·9941	12·05	21·11	0·58	0·46	0·09	2·98	0·395	0·10	0·125	0·211	0·184	0·015
1912—E Hermitage	0·9935	12·58	22·06	0·70	0·60	0·08	2·94	0·347	0·12	0·077	0·245	0·238	0·041
1912—F Hermitage	0·9937	12·05	21·11	0·71	0·63	0·066	2·86	0·342	0·11	0·087	0·245	0·238	0·041
1912—White Shiraz	0·9885	13·52	23·70	0·67	0·59	0·060	2·04	0·222	0·12	0·008	0·189	0·220	0·059
1912—H Verdot	0·9942	11·35	19·89	0·74	0·68	0·050	3·02	0·353	0·09	0·057	0·242	0·214	0·021

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS.

Branch.	Honorary Secretary.
Albury	Mr. J. D. Lankester, Albury.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Beckom	Mr. S. Stinson, Beckom.
Bonville	Mr. H. B. Faviell, Bonville.
Bungalong	Mr. E. Hughes, Oakleigh, Cowra Road, *vid* Cowra.
Cardiff	Mr. F. B. Cherry, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Collie	Mr. C. J. Rowcliff.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coreen-Burraja	Mr. Wm. Stodart, Coreen, *vid* Corowa.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Derain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. Duffy, Henty.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	Mr. C. F. Boughton, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S Stening, Little Plain, *vid* Inverell.
Lower Portland	Mr. G. Gosper, Lower Portland.
Mangrove Mountain	Mr. G. T. Hunt, Mangrove Mountain, *vid* Gosford.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Moruya	Mr. P. Flynn, Moruya.
Narrandera	Mr. C. F. Pearce, Narrandera.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains
New Italy	Mr. F. A. Morandini, New Italy.
Nimbin	Mr. J. H Hutchinson, Nimbin.
Orangeville	Mr. C. Duck.
Orchard Hills (Penrith)	Mr. H. Basedow, Orchard Hills, *vid* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose-Kareela	Mr. L. Pieremont, "Vila," Penrose.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Spring Hill	Mr. J. A. Henry, Spring Hill.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Tallawang	Mr. J. E. Hansall, Tallawang.
Toronto	Mr. J. G. Desreaux, "Esmond," Toronto.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the Branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Demonstrations in Pruning and Fruit-packing.

Honorary secretaries are reminded that all requests for pruning or packing demonstrations for this year should reach the Department as early as possible, in order that arrangements may be made in ample time.

Demonstrations in Clearing Land and Subsoiling with Explosives.

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. H. C. Coggins, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

NOTES AND REPORTS FROM BRANCHES.

Coonabarabran.

At the February meeting of this branch a paper on "Fungous Diseases of Plants," by Mr. C. Crane, B.A., of the Wagga Experiment Farm, was read to a good audience. The following is the text of the paper:—

FUNGOUS DISEASES OF PLANTS.

In this article I propose to discuss the following diseases:—Rusts, Smuts, Take-all, and Irish Blight. A knowledge of the life-history of fungi will help us to understand how they are reproduced, how they are spread, and what steps should be taken to combat them. Fungi are a low order of parasitic plant life, and though, of course, each of the above diseases is produced by a different fungus, a general description of any one of them will apply more or less to the whole family. The fungus which enables us to study its life-history with the least trouble is that which produces the green furry-looking mass on decaying fruit, or on the top of a bottle of imperfectly preserved fruit. By placing a little of this matter on a slice of bread covered with jam, well moistened and placed in a dark, warm place for some hours, whitish spots will form,

increasing rapidly in size till the jam is completely hidden by a mass of long, whitish threads, somewhat resembling in general appearance a mass of loose cotton wool. In a few hours, or at most a day in warm weather, those threads will be seen to be covered with small, dark-covered balls, which become so numerous as to give the whole mass a dark appearance.

These balls contain the spores of seeds which are responsible for the distribution of the fungus. They ripen and dry, and, just as the seeds of other plants retain their vitality for long periods, so may these be carried by wind, insects, clothes, machinery, &c., and then germinate as soon as conditions are favourable. In the case of many fungi, the spores are the only visible portion, the mycelia being completely inside the tissues of the plant.

Although the treatment recommended for each of these diseases depends upon the nature of the particular fungus which produces it, the general methods of treatment are based upon the following considerations :—(1) Fungous diseases are spread by tiny spores distributed by wind, implements, clothing, insects, remains of infected crops, &c. ; hence, refuse from a diseased crop should be as quickly and thoroughly destroyed as possible. (2) The bags in which infected grain or potatoes have been kept are a source of danger, and should be soaked in bluestone or other similar bath; potato-peelings thrown on to a rubbish-heap may be a source of a fresh outbreak. (3) The timely removal of a diseased plant may in some diseases prevent further spread. (4) Many weeds act as hosts, and care should be taken in working fallows to destroy all such. (5) A system of rotation should be introduced, so that different crops, not susceptible to the attacks of the particular disease, may intervene, thus affording an opportunity of starving out the fungus. (6) Good cultivation, &c., produces healthy crops, which are better able to resist disease than weaker crops. (7) The development of the parasite may be checked or stopped by the timely application of some fungicide. (8) Prevention is better than cure.

The method of treatment will depend upon (a) the method of dispersion of spores, and (b) the mode of infection.

Commencing with the Smuts, they may be classified as follows :—

TABLE OF SMUTS.

(*Quoted from Dr. McAlpine's work, "The Smuts of Australia."*)

Cereal.	Kind of Smut.	Dispersion of Spores.	Mode of Infection.
Wheat	Stinking Smut, or Bunt.	Threshing time ...	Seedling.
,, ...	Loose Smut ...	Flowering time ...	Flower infection.
,, ...	Flag Smut ...	Before and up to flowering.	Seedlings and young shoots.
Oats	Loose Smut ...	Flowering time ...	Seedling.
Barley	Naked Smut ...	Flowering time ..	Flower.
,, ...	Covered Smut ...	Threshing time ...	Seedling.
Maize	Corn Smut ...	At all times during growth.	All growing parts.

Stinking Smut or Bunt.—The spores of this fungus are distributed with the seed, and germinate under conditions similar to those favourable to the germination of wheat. The fungus enters the seedling at a very early stage, and though giving practically no sign of its presence, yet develops with the plant till after the plant flowers. Then the spores form where, under healthy conditions, the grain would have been—that is, within the seed coat of the grain, forming the "bunt ball." This ball, though almost the same in shape and appearance as the grain, is yet shorter and plumper, and is found on crushing to contain a fine sooty powder with a strong objectionable smell. The ball being shorter and plumper than the natural grain causes the glumes to stand out, giving the ear a loose, ragged appearance. During harvesting and the subsequent operations of grading and drilling, these balls may be burst, thus spilling the powder on the sound grain, bags, machinery, &c. At the end of a grain of wheat are a number of hairs in which the spores are held, thus greatly increasing the difficulty of cleaning a sample of seed wheat.

As the fungus is thus distributed with the seed, it is possible to check it very largely by treating it with some material which will act as a fungicide. Of course, in cases of bad outbreaks it would be necessary to resort to bare fallowing and rotation.

The method of treating the seed which is in most general use is, perhaps, the bluestone solution. A 2 per cent. solution is prepared by suspending 2 lb. of copper sulphate (enclosed in a piece of canvas) in 10 gallons of water. The wheat should only be left in long enough to ensure complete wetting—a few minutes; agitate, and then allow to dry in the bag. It must be remembered that bluestone very seriously affects the germination of the seed, and to overcome this it has been advised to dip afterwards in clear lime water.

Flag Smut.—As the name implies, this fungus attacks the leaf sheath, flag, or blade, causing it to curl up, and preventing the formation of the grain.

The first indications of the disease are to be found on the leaves, in the form of long grey stripes running parallel with the veins. Soon the skin of the leaf ruptures, releasing the spores and having something the appearance of rust. It is often called "black rust" by farmers.

In some cases the plant withers and dies; in others, instead of an ear forming, there will be but a twisted mass of diseased tissues. These curled and diseased leaves fall and are the main source of infection for the succeeding crop.

From experiments by McAlpine, it appears that flag smut is most troublesome in early sown wheat in a dry seed-bed, for the disease and the wheat germinate together, and as will be seen in the table, infection takes place in the seedling; such conditions are most suitable to the disease. On the other hand, if the seed is sown on ground which has been moist for some time, the conditions are not so favourable to the spread of the trouble. Only by fallowing and rotation of crops can the farmer cope with a bad outbreak. It is thought that rye and barley serve as hosts, and therefore oats is a safer rotation crop.

Rust.—This disease is clearly visible in the form of reddish coloured patches on the diseased plant. The colour is due to the spores of the fungus. By living as a parasite on the juices of the plant it checks development, and the affected plant produces small ears, with pinched and light grain.

It is a vexed question how the disease is carried on from year to year, rival theories being that the spores remain in the ground, that they are distributed on the seed as are the spores of bunt, while a third theory is that, just as the mycelia of the rusts and smuts lie hidden within the tissues, so does the fungus responsible for the disease lie latent within the actual grain, so that it would be useless to try and cope with rust by treating the seed.

McAlpine ("Rusts of Australia") gives three possible methods of coping with rust:—(1) To produce wheats suitable to our conditions by crossing (which is not within the farmer's scope); (2) to select and cultivate the best rust-resisting plants from wheats which are satisfactory in other respects; (3) cultivate early maturing varieties, sow them early, and practise clean cultivation, judicious rotation, fallowing and suitable manuring.

Take All.—This is a fungous disease which seems to be confined to the wheat plant, and which is reproduced from year to year by spores left in the ground, in which respect it differs from bunt, which is for the most part distributed with the grain. The disease may occur at any stage in the plant's development. Should it attack a plant before the stalks are well developed, the plant will shrivel up and die; but should it attack a headed crop the heads suddenly whiten and the plants die, hence the name "White-heads" under which the disease is sometimes described, It may attack a whole crop or, as is more usual, patches only will be affected, which patches vary from a few yards to an acre or more. Should there happen to be any oats in such affected patches they will remain uninjured. It is said to attack barley or barley grass, but oats seem to be quite immune. By taking off the lowest flag of a diseased plant there will be disclosed a blackish ring encircling the stalk.

By burning off affected stubble all the spores above ground will be destroyed, but the most satisfactory method is to starve it out by keeping the land free from all plants likely to serve as hosts. A bare fallow properly worked to conserve moisture is effective, and a crop of oats grown as a rotation crop is also satisfactory.

Irish Blight of Potatoes.—Every potato grower should be on the alert to detect this disease. It is first observed on the leaf, which loses its bright green colour and becomes blotched, generally, but not necessarily, at the tip of the leaf. These blotches are at first pale yellow, but later turn brown or almost black, and finally completely decay, giving a most offensive odour. On the underside of the diseased leaf the mycelia of the fungus may be seen giving it the appearance of having been lightly sprinkled with flour, this being much more easily seen in moist, warm weather. The bulk of the fungus is within the leaf, the visible white spots being merely the fruiting portion, and the powdery appearance is due to the millions of spores. The white patches round the dead leaves are the most characteristic feature of the disease. As the leaves are destroyed the fungus attacks the stems, and the whole plant above ground may be destroyed. The whole crop is frequently attacked, and the march of the disease is so rapid that at times

it looks as if the whole crop had been frost-bitten. The potatoes themselves become diseased, though the appearance of the diseased tuber is not so characteristic as that of the diseased leaf. Sometimes they are scarcely marked, whilst at times they are absolutely rotten. On the surface of an affected tuber there are generally numerous sunken brown patches, which, if cut across, show but small patches to be diseased. At other times there is no outward evidence, though on cutting the tuber there may be seen small isolated or connected brown patches just under the skin. If there be sufficient moisture the whole tuber may quickly become diseased, while in other cases decomposition only sets in during the winter. Thus the difficulty of detecting the disease in the tuber is considerable.

Eradication of the disease may be effected in the following ways: (1) Affected areas and districts should be quarantined, so that the disease may not be carried to clean districts. (2) All diseased tubers and all refuse from an affected crop should be burnt. (3) Tubers from an affected area or district should not be used as seed. (4) A system of rotation of crops is necessary. (5) Other members of the same family, such as the tomato, tobacco, &c., are capable of serving as hosts. (6) In cutting sets, strict watch should be kept for the characteristic discoloration, and the knife should be dipped in disinfectant if a diseased tuber be cut. (7) Clean bags should always be used for storing seed. (8) As the infection of the newly-formed tuber can only take place after the spores have formed on the leaves, it is possible to effectually check its spread by using the spray cart judiciously, the material used in the spray being Bordeaux mixture.

In areas in which the disease has made its appearance it has been found advisable to spray regularly, even though the disease may not have actually made its appearance. The first spraying should be done when the plant is from 6 to 9 inches high, and again at intervals of about a fortnight, should the season be favourable to the disease. This disease is most dangerous in warm, moist weather. In spraying, care must be taken to spray all parts of the leaf, the under side especially.

Discussion.—Mr. D. Cameron said the paper advocated all wheats being dipped in a solution as a preventive against smut. His own experience was that so long as clean wheat was grown in clean ground, the crop would be free from smut. For the first two years he had cleansed his wheat seed with bluestone, but of late years there was no necessity, as smut became extinct.

Mr. Liebentritt was of the same opinion as the last speaker. If the seed and ground were clean, there was little danger of smut, though he believed a poor condition of the soil may induce smut. The best test he knew for ascertaining if smut existed in the seed was to place a handful in water, when the affected grain will immediately float to the top.

Mr. S. Sowden said he had been growing wheat for many years, and for ten years he never had smut in any of his crops, when it made its appearance without any cause. He had used bluestone extensively, and still smut appeared. Personally, he did not mind smut in a crop so long as he did not require any of it for seed purposes. He had one paddock which was ruined with smut, but which was sown with wheat the two years following, and the crops cut early for hay. The third year dry, clean wheat was sown, and showed no signs of smut.

A vote of thanks was accorded Mr. Crane for his very instructive paper.

Mr. J. W. Mathews, Sheep and Wool Expert, visited Coonabarabran on the 25th February.

Several members' flocks were inspected and a practical demonstration given on live sheep. This was supplemented by a further demonstration with wool, during which the various classes of merino and cross-bred wool were dealt with, not only in relation to their essential qualities, but also in respect to the approved methods of classification.

The Dual-purpose Sheep.

In the evening a lantern lecture was given, during which the Departmental experiments in the cross-breeding of sheep were referred to, and the points upon which information is being sought in the conduct of these experiments were fully explained. It was pointed out that for the maintenance of dual-purpose sheep the longwool on the merino was the most suitable combination, and breeders would require to determine which breed to employ, once having obtained a grasp of the principles. The Lincoln-Merino cross was favoured for a heavyweight mutton sheep, but if the breeder desired an early maturing animal, the Leicester or the Border Leicester would be found to be the more suitable type.

It was pointed out that the use of the Down breeds was restricted to the raising of the 5-months lamb, and under local conditions the Down breeds were not recommended. The Down breeds could only be profitably employed where the breeder was situated in close proximity to the railway, and those conditions did not exist at Coonabarabran. It was also indicated that the breeding of cross-bred sheep necessitated something more than the natural pastures, and small farmers entering into cross-breeding would require to consider the growth of fodder crops. Heavier bodied sheep required a food supply correspondingly greater than would suffice for the smaller bodied merino.

IMPROVEMENT OF MERINO FLOCKS.

On the following evening a lecture embracing the breeding and treatment of merino sheep was delivered. It was stated that the successful growth of merino wool depended to a very large extent on the conditions under which the sheep were kept. Merino wool could not be grown on rabbit-infested country, nor could it be produced at its best on country that was in its natural state, and on which the suckers and small bushes were not kept in check. Although the extermination of rabbits and clearing of the country appeared somewhat costly, the money spent in that way would be amply repaid by the increased returns that the sheep would yield. At the present time merino wool is yielding a very satisfactory value, and as the future of this wool is almost assured, there should be sufficient inducement for a man breeding this class of wool to improve his country. In the breeding of merino sheep, uniformity in breed and in the growth of the wool was urged. To secure this it would be necessary to have a systematic and regular method of breeding. Every year before shearing, the ewes should be carefully gone through for the purpose of culling and classification. There should be a regular time at which the rams should be joined with the ewes, and farmers should aim at producing a more uniform class of sheep. It was explained that this could only be obtained by paying due attention to management of the flocks.

The question of type was also referred to, and breeders were advised to carefully study their local conditions, and to observe the type which appeared to do best not only in the district, but in their own particular locality. The plain-bodied type of merino, and one producing a good length of staple, consistent with density of fleece, was the type recommended. The visitors were advised of the Government's intention of establishing small merino flocks for the purpose of distributing a good class of flock rams amongst settlers.

The lectures were well attended throughout, and the gatherings represented well the breeders of the district.

Coreen-Burraja.

Messrs. Wm. Stodart and Walter Ross have been appointed secretary and treasurer respectively to the above branch, in place of Messrs. Leveridge and Vickers, who are retiring.

Mr. H. C. Stening, Assistant Inspector of Agriculture, delivered a lecture on "Wheat Growing" on the 22nd February, to members of this branch.

Mr. Swan, President of the branch, occupied the chair.

WHEAT GROWING.

The lecturer dealt with culture of wheat from the early preparation of the soil to the harvesting of the crop. Much stress was laid on the importance of conserving moisture in the soil by the practice of fallowing; of grading wheat intended for seed; of applying superphosphates; of pickling seed-wheat for the prevention of stinking smut; and of growing fodder crops in rotation with wheat for the purpose of restoring humus in the soil and maintaining fertility.

At the conclusion of the lecture, those present who were desirous of further information were invited to ask questions.

The following are some of the questions put and replies given:—

Question: How do you account for the fact that a crop on unfallowed ground yielded more last year than that on fallowed ground in an adjacent paddock?

Answer: Before replying to that question, the lecturer said he would like to ask if the unfallowed land referred to had been cropped as long as the fallowed land. The reply being in the negative, he said that it was not fair to make comparisons between the two,

as the land that had been cropped the longer would have had its fertility reduced the more, and would be more deficient in humus, and consequently less retentive of moisture. At the same time unfallowed land, in many instances, in the later districts last season, yielded quite as well as the fallowed, but it must be remembered that these districts were favoured with an exceptionally good season, the like of which might not occur more than once in a decade. He would strongly advise that land should be fallowed on the lines mentioned in his lecture, and thus eliminate the risk attaching to a system of continuous cropping. Whatever the season, good or bad, good crops were assured on fallowed land, and the business was placed on a sounder footing.

Question: Do you not think that in working a fallow it is possible to cultivate it too much?

Answer: The fallow *can* be overworked. Too much cultivation may have the effect of pulverising the soil-mulch too finely. When the surface particles are in a fine state of division, they are very liable to run together and cake hard, the soil-mulch thus being rendered ineffective. Cloddy mulches are most effective.

Question: If the fallow is cultivated after every rain, as you stated in your lecture, would this not lead to overworking?

Answer: It was recommended that the fallow should be worked after each *heavy* rain, when a union is made between the loose surface soil and the moisture-laden subsoil. When such takes place it is possible for the moisture conserved in the lower soil to rise to the surface, and to be dissipated in the dry atmosphere, thus undoing all the good already accomplished. Such heavy rains are not so frequent during the southern summers that there should be any danger of overworked fallows.

Question: Will you explain how it is that crops on land that had been consolidated, for instance, where there had previously been a cart-track, did not "burn-off" like that on loose soil?

Answer: It is most important that, although the surface soil should be loose, the sub-surface soil should be firmly compacted, for the closer the soil particles are packed together, not only will the soil have a greater capacity for storing moisture, but the moisture will move more quickly, so that in such a case as last spring, when the dry conditions and hot winds caused rapid evaporation from the surface, the moisture would press in more quickly from the lower soil to take the place of that evaporated at the surface, and thus supply the needs of the plant.

Question: Do you consider that seed sown on a dry seed-bed should be pickled?

Answer: Yes; the seed should be pickled always, whether the seed-bed is dry or wet. So long as the seed is thoroughly dry before sowing, there is no danger of injuring the seed by sowing it pickled in a dry seed-bed. The theory held by many farmers that smut would not result from seed sown in a dry bed has "had the bottom knocked out of it" during the past season. Many crops were sown untreated, on this assumption, and as a result there are reports of a large percentage of smutted wheat.

Question: How do you account for the seed treated with bluestone and sown on a wet soil resulting in a smutty crop?

Answer: In order that he might answer that question, Mr. Stening said that he would like the questioner to tell him first how the seed was pickled and what the strength of the solution used was. [The questioner said the seed was pickled in a tub, half a pound of bluestone being used to a 3-bushel bag of wheat; he could not say how much water.] It was pointed out that this was a very haphazard method of pickling, as the strength of the solution was not known, and probably it was too weak to have any effect upon the spores of the smut. It was most important that the pickling should be done carefully, and the solution be of the correct strength; 1 lb. of bluestone should be dissolved in 5 gallons of water, thus making a 2 per cent. solution. The grain should be immersed in this, and vigorously agitated during immersion, to ensure that the fungicide came in contact with every part of the grain. The smut balls should also be skimmed off. As the solution in the tub decreased it should be replaced by more 2 per cent. solution, previously prepared. In order to neutralise the action of the bluestone in injuring the germination of a percentage of the seed, the wheat, after draining, should then be immersed in a 1 per cent. lime solution. The increased germination would repay the extra trouble.

Question: How is it you do not recommend Bunyip as a hay wheat?

Answer: Only those varieties which give the best yields of hay of the best quality are recommended as hay wheats. Bunyip is only a medium strain, and the hay it produces is not of as good quality as Firbank, which is recommended as a much better hay wheat.

Question: As we only require hay for our own use, what we cut from the headlands usually suffices.

Answer: In this case the headlands and tracks should be sown with Firbank.

The CHAIRMAN: I notice you did not mention Steinwedel among the varieties you recommended. What is your opinion of this variety?

Answer: Steinwedel can well be recommended as a hay wheat. Although a good yielder of grain, it is not recommended for this purpose by the Department on account of its poor milling qualities, its strength being considerably below the standard fixed. Another great fault of this variety is that it is extremely susceptible to bunt, and also it does not hold its grain well.

The CHAIRMAN: If, as you say, Steinwedel is such a poor milling wheat, how is it that a miller at Wahgunyah has given me 3d. advance for Steinwedel over Federation? The price paid for Steinwedel was 3s. 2d., and that for Federation 2s. 11d.

Answer: The lecturer said he was at a loss to explain the action of this miller. In contravention of what apparently was his opinion of these two wheats, it was said that a miller with a very large business in this State stated that he wanted nothing better than Federation, but that Steinwedel and the old Purple Straws were too inferior. This contention was also borne out by repeated milling tests conducted by the Department's chemist, which had shown Steinwedel to be uniformly below the standard for strength, and Federation to be of satisfactory strength.

The CHAIRMAN: The miller at Yarrawonga told me the same as you were informed—that Federation was as good as he required.

Question: Do you advise that bluestone be dissolved in boiling water?

Answer: Bluestone dissolves more readily in hot water; but it matters little whether dissolved in hot or cold water, so long as it was thoroughly dissolved.

Question: What is the cause and treatment for "Take-all"?

Answer: Take-all was due to a fungus in the soil which attacked the roots, and subsequently the plant. Sometimes the plants were attacked when in ear, the disease causing the ears to turn white; it was then known as "whiteheads." The only satisfactory means of treating the disease was to starve the fungus out. As the fungus would not thrive on oats, it could be effectually starved by growing a crop of oats, to be followed by a year of clean fallow, before again growing wheat.

A vote of thanks was accorded the lecturer for his address.

Forest Creek.

Arrangements are being made by Mr. J. G. R. Bryant, Assistant Fruit Expert, for a lantern lecture to be delivered on "Fruit Culture." At the same time Mr. Bryant will give a demonstration of pruning.

Mr. H. C. Stening, Assistant Inspector of Agriculture, delivered a lecture on "Wheat Growing" to members of the above branch in the local school on 6th March. There was a good attendance.

WHEAT GROWING.

The many advantages to be derived from the practice of fallowing were pointed out. Stress was laid on the necessity for cultivating the fallow, an example being given of two crops on fallowed land near Harden. One crop on fallow that was not cultivated yielded 23½ bushels per acre, while that on adjacent cultivated fallow, sown under precisely the same conditions, with the same variety of wheat, yielded 33½ bushels, or an increase of 10 bushels per acre in favour of the cultivated fallow.

Varieties suitable for the district and their characteristics were enumerated, and it was advised that the seed should be graded and treated for prevention of bunt before sowing. The benefits to be derived by drilling the seed in preference to broadcasting, and by the use of fertilisers, were explained. Harrowing the crop for the maintenance of the soil mulch, and feeding off the crop when favourable conditions promotes early vigorous growth, were recommended.

Katoomba.

A meeting of this branch was held on the 27th January, at which it was decided to compete at the Sydney Royal Show for the District Apple Trophy. Several of the leading growers promised to contribute in order to make the exhibit a success.

Kellyville.

January was a busy month for the members of the Kellyville Branch of the Bureau. On the 8th, a demonstration of the use of red spraying oil was given at Mr. Boughton's orchard by the Vacuum Oil Company; on the 13th, the trials were repeated at Mr. Glasgow's orchard, when the International Harvester Company exhibited one of their motor sprays. On the 18th, the ordinary monthly meeting was held, when Mr. J. Armstrong gave an address on "Fruit-growing," and on the 23rd Mr. Warry, the Government Apiculturist, lectured before the members on "Bee Culture."

Fruit-growing.

Mr. Armstrong, when giving his views on fruit culture, said others might hold different views from his own; he merely spoke of his own experiences, and invited discussion on any point whereon others differed.

The first point to be considered was the soil. For purposes of comparison, he would consider two sorts—black soil and sandy soil. He thought sandy soil would produce citrus fruit of better quality, but he preferred the black soil for quantity. Sandy soils needed the most feeding, but good fruit could be produced on black soil at less expense.

Mr. Firth remarked that 6 lb. of manure to the tree on sandy soil produced no more fruit than 2 lb. on black soil.

Mr. Armstrong said he preferred an easterly aspect, and advocated careful preparation for planting; the fibrous roots of the young tree were so delicate that the soil must be well fined down and in good condition. He was doubtful about the benefit of subsoiling, but if a grower decided to subsoil he would give a word of caution about bringing any of the subsoil to the surface; it set hard, and might make good road material, but it was out of its place on the surface in the orchard.

Stock.—He considered trees budded on orange stock yielded smaller fruit, and made slower growth. Trees budded on lemon stock were preferable; they made quicker growth, and formed larger trees. For navel oranges, vigorous growth was particularly necessary, for size of fruit was everything when it reached the market.

Drainage.—The more underground drains there were within reason, the more moisture the soil would retain. In England the shallowest drains were 3 feet deep, and cross drains 4 feet to 4 feet 6 inches. For our conditions, shallow drains well out of the way of cultivation were to be preferred, as they dealt better with heavy rains and carried the surplus water off more quickly.

Planting.—The citrus tree was a surface feeder, and he did not favour planting too deeply. He had planted trees 18 feet apart, and after some experience he planted 20 feet each way; but now, with more experience to guide him, he planted nothing less than 22 feet.

Manuring.—Perhaps no grower in Kellyville used less artificial manure than he did. On his black soil orchard, he preferred to cart bush leaves, stock manure, and virgin soil. Trees needed feeding, but he used artificial manure only when he had no time to cart leaves and soil. The value of stock manure depended upon the feed the animals receive, that from hand-fed stock being much superior to that from grass-fed animals.

Mr. Armstrong considered the growing of pumpkins and melons among young trees detrimental to them; tomatoes and corn were also severe, but he did not consider potatoes, peas and vegetables of that sort hurtful, if not too near the trees. He was a firm believer in keeping the orchard clean, and in regular surface mulching.

Leech's Gully.

The February meeting of the above branch was held in the local hall, with a good attendance of members. Mr. G. R. Smith was chairman. It was decided to order 3 cwt. of lucerne seed for distribution among members, and it was also agreed, on the motion of Mr. Jordan, seconded by Mr. D. B. Weir, that all requiring seed should hand in their names by the 28th,

stating the quantity required. A good discussion then took place as to the best methods for the cultivation of lucerne, and on the origin of dodder in lucerne.

The PRESIDENT called on Mr. J. Mansfield to relate his experience.

Mr. MANSFIELD said he had tried a small area treated with lime and superphosphate sown last autumn; the land was well cultivated. The seed came up well, but was damaged with hail whilst young, on top of which it was attacked by an insect, as a result of which adverse conditions very little was left.

Mr. C. BATTAGLINE, who is the fortunate possessor of a good lucerne patch, said he sowed the seed last March in ground not particularly carefully prepared; the seed came up well, and the crop had done well.

Mr. D. B. WEIR said he had sown on four different occasions, and had had no luck at all, and blamed the seed. He advocated a cover crop such as wheat for example.

Regarding dodder in lucerne, Mr. HOLLY said he had been informed on good authority that machinery could not separate dodder from lucerne seed. The crop would have to be watched closely, and the dodder removed and burnt as soon as it appeared.

It was resolved that at next meeting members should bring samples of maize grown by them for discussion.

Lower Portland.

A meeting of the above branch was held at Lower Portland in the School of Arts, when Mr. R. Wetherill read a paper on "Tomato Culture." A useful discussion took place, and some useful hints were thrown out by members present.

Narrandera.

A branch of the Agricultural Bureau has been formed at Narrandera with the following gentlemen as office bearers:—Mr. C. A. Russell, Chairman; Mr. H. N. Devlin, Vice-Chairman; Mr. C. F. Pearce, hon. Treasurer and Secretary.

Orchard Hills.

A lecture on "Insect Pests" was delivered by Mr. W. W. Froggatt, Government Entomologist, on the 24th February. A good number of members attended, and the lecture was much appreciated by the branch.

Penrose–Kareela.

The usual monthly meeting was held on the 10th February. It was resolved that the members endeavour to help the Department by collecting insects common in the district. A demonstration was given by Mr. J. H. Channon, of the firm of N. Guthridge, Ltd., on Mr. Cook's property, in clearing land by rendrock. The demonstration proved conclusively to those present that clearing with explosives is cheaper and more effective than with axe, pick and shovel.

Sackville.

A lecture on insect pests was delivered by Mr. W. W. Froggatt, Government Entomologist, to members of the above branch on March 19th.

Walla Walla.

At the February meeting of this branch a paper on the cost of wheat production in the Walla Walla district was read by Mr. H. D. McIntyre.

As a basis for his operation Mr. McIntyre considered that the land would be worth £5 per acre; therefore the interest at 5 per cent. per annum would be 5s., which would have to be charged against the cost of production as rent. The operations necessary for wheat farming were set down as follows:—

	£	s.	d.
Ploughing once at 5s. per acre	0	5	0
Cultivating twice at 2s. 6d. per acre	0	5	0
Harrowing twice at 1s. per acre	0	2	0
Drilling once, per acre	0	2	0
Superphosphate, per acre	0	2	0
Seed, per acre	0	3	3
Harvesting, per acre	0	5	0
Bags, per acre.	0	3	0
Carting to station, per acre	0	1	6
Depreciation of stock and implements at 10 per cent. per annum	0	5	0
Rent	0	5	0
	£1	18	9

The average yield in the district is 18 bushels, and the average price 3s. 3d. per bushel, equalling £2 18s. 6d. per acre. After deducting the cost of production, which is £1 18s. 9d., this leaves a net profit of 19s. 9d. per acre. The figures were discussed at some length by those present, and many farmers expressed the view that the estimated cost of production was rather on the low side.

Departmental Note.—Mr. H. Ross, who for several years occupied the position of Inspector in the Southern district, considers the figures as given by Mr. McIntyre fairly correct, excepting the 10 per cent. allowed for depreciation of implements, &c., which amounts, according to Mr. McIntyre's statement, to 5s. per acre. Without reckoning the rent of land, the depreciation of stock and implements, or bags and cartage, it can be safely said that a crop of wheat can be sown and harvested for £1 per acre.

Wetherill Park.

On the 19th February a very interesting and instructive demonstration was given, under the auspices of the local branch of the Agricultural Bureau, at "Burilda." Two sessions were held, work in subsoiling and land-clearing being done in the morning, and in clearing only in the afternoon.

Fully seventy-five farmers, and others interested, attended both sessions.

Demonstration of Subsoiling and Land-clearing with Explosives.

Mr. H. C. Coggins, of the Department, explained the method, and stated that explosives were going to play a very important part in agriculture generally in the future, especially where the subsoil was compact, or made impervious by the "hard pan." It had been proved beyond question that a vast amount of plant food is stored in the subsoil to a depth of some 20 feet, and it was absolutely impossible to grow any crop successfully if the root system was going to be confined to the top soil.

The generality of Cumberland soils is not very different to soils in other parts of the State, a shallow top soil, with a clay subsoil, being common, and in the majority of instances it is the top soil only that has to do all the work. This is easily proved by the great number of trees that die every year, some from too much moisture, others from drought. If the subsoil was stirred, and the roots encouraged to go down after the food and moisture, they would be in a far better condition to withstand either drought or excessive rainfall. What is badly required, especially in the Cumberland district, is subsoiling, and the best method, the most up-to-date, quickest, and least expensive, is by explosives. If proper care is taken, there is not the least danger, but if one gets careless in their use, then it means trouble.

The explosive used on this occasion was "gelignite," and the Nobel (Glasgow) method was adopted.

The first illustration of one of the uses of explosives in the orchard was the subsoiling of a lemon tree, some 20 years old. A hole was bored at an angle of 45 degrees, about 18 inches from the trunk of the tree, the depth of the hole being about 2 feet 6 inches, just clear of the root system. The charge, which consisted of one plug of gelignite, with detonator and safety-fuse attached, was then inserted and the hole well tamped. Some thought that the tree would certainly be blown out, but the only effect was that the tree rose sharply about 4 inches and then receded to its former position. The vibration of the shot was felt about 15 feet away, this vibration being, in fact, the shattering of the subsoil. This tree was in a bad way, owing to the want of moisture; there was a small crop of fruit on it, but only of the size of marbles. The future progress of this tree

will be watched with interest, as some seemed doubtful as to the wisdom of treating trees in such a manner. The real effect of the subsoiling upon the tree may be said to be: (1) The concrete-like hard-pan has been broken, and the stiff, hard, clay subsoil has been shattered, thus allowing future rainfall to be conserved; (2) the roots have been given the opportunity they wanted, to go down after the moisture and plant food stored in the subsoil; (3) the shock occasioned by the explosion has helped to destroy the organisms of any root disease that may exist.

Mr. Coggins then gave a demonstration in subsoiling on open land. Holes 20 feet apart were charged with one plug and fired as in the first instance. There, again, the shock and vibration were felt from 10 to 15 feet away. This method may be adopted either in a full-bearing orchard or in a cultivation paddock. How far apart the charges should be will depend on the strength of the subsoil; in some cases, such as a strong, hard, and very dry subsoil, as close as 10 feet would be necessary; but where the top soil is deep, as far apart as 15, or even 20 feet will be effective.

Several questions were asked as regards the drainage of subsoiled land.

Mr. Coggins stated that one of the great advantages of subsoiling was the better and proper drainage of the land. By varying the depths of the holes, a paddock can be drained to any desired point, even though the land be perfectly flat and low-lying. Water will find its own level always, and if the subsoil is in such a state as to prevent the water from percolating away, the top soil becomes full, and trouble starts immediately. If the subsoil is porous, and is capable of admitting air, then the drainage will naturally be good. This very important fact is too often lost sight of. Swamps have been drained by this means, and turned into profitable cultivation paddocks. The demonstrator said that most people were under the impression that subsoiling with explosives is new, but for upwards of twenty years this method has been in vogue in other parts of the world, and it had become a recognised item in farming. We should realise that this country of ours was, after all, only a young country, and to make farming a payable proposition we should adopt scientific and up-to-date methods. The day of the conservative farmer was past. The mind of every man on the land nowadays should be open to receive new ideas, otherwise what would be the use of experiments and demonstrations?

The company then adjourned to a lower paddock to witness "land-clearing." A stump, some 2 feet 6 inches in diameter, was selected as the victim, and holes about 3 feet deep were bored, at an angle of 45 degrees, under the roots. Four holes were found necessary, and eight plugs and a primer to each hole. In this instance the electric detonator fuse was used, instead of the safety fuse used for subsoiling. The fuse wires were connected up with each hole, and the two ends connected with the cable, which, when all was ready, was in turn connected with the electric battery which was stationed some 150 yards distant. This last operation was not completed until after the circuit had been tested by a special instrument called a "galvanometer," a useful instrument which immediately indicates whether the circuit is complete or not.

After everyone had retired to a safe distance, the "Rock Bar" exploder handle was pushed down, and up went the stump in all directions. A rush was immediately made to ascertain the effect. Various estimates were made as to the cost of grubbing the stump by hand, but all agreed that the cost of the gelignite, fuse, labour, &c. (7s. 6d.), was 50 per cent. at least below the older method.

Mr. Coggins took advantage of the opportunity to urge all present to become members of the Agricultural Bureau, and thus partake in the many advantages offered by the Department for the advancement of agriculture and the district generally.

Mr. Burrows, expert for Messrs. Dalgety and Co., Ltd., operated.

Several farmers present signified their intention of adopting the method, and all seemed perfectly satisfied with the practical demonstration of what may be done.

Wolseley Park.

Mr. H. S. Major, Assistant Sheep and Wool Expert, delivered a lecture to the members of the Wolseley Park Bureau, in the Mechanics' Hall, on the night of Thursday, 20th February. As requested, he took for his subject "The Breeding of Sheep for wool, for mutton, and for a combination of wool and mutton."

The Breeding of Sheep.

Mr. Major said that before the farmer decided on the selection of his sheep he must first study his own conditions (*a*) as regards locality, proximity to rail and market;

(*b*) climate, mean annual temperature, and the rainfall; (*c*) the soil, and what it was capable of producing in the way of pastures or crops. Indicating the merits of the merino from a wool standpoint, he said that the merino in New Zealand, Tasmania, and Victoria had been largely displaced by cross-breds, and there was a tendency in New South Wales to introduce the cross-bred into districts eminently suitable for the merino. The great point in favour of the small Merino flock of say 1,500, lay in the uniformity of his wool clip, and he should breed and select with that aim. The farmer's Merino was essentially the big-framed plain type. They should select for size of frame, length of staple, and medium quality of wool, with a well-defined crimp, and in their original stocking of the farm should buy aged ewes from some well-known Merino flock, rather than young culls. The flock Merinos of big estates were the indirect progeny of very high class rams and ewes, and by the farmers buying aged sheep, which had survived the yearly culling, he could more quickly build up the standard of his young flock.

It was disadvantageous for a small flock-owner to breed his own rams, and perhaps the best course for him to adopt was to select good flock rams from two or three studs having the same blood, though not necessarily closely related. He did not favour the very wrinkly type of Merino, on the grounds that the advantage claimed for it as regards weight of fleece (due to excessive yolk secretion) did not compensate for its many other indifferent qualities. The wrinkly skin rendered the fleece uneven in quality, and short in staple; the sheep was a bad doer, and would not travel well; it was the first to be attacked by the maggot fly; and the "ribbed" nature of its pelt considerably lessened the value of the basils, which were much below the value of the basils of plain-bodied Merinos. The increase of cross-breds, and the consequent diminishing output of merino wool, must harden values for the latter, and merino wool growers could confidently look forward to high prices being maintained.

It was pointed out that, though the British longwool cut heavy fleeces, the price per lb. was low, and was subject to greater market fluctuations than merino wool. The fabrics manufactured from Lincoln and Leicester wool were limited in number, in consequence of the extreme coarseness of the wool. In addition, these breeds, in their pure state, required rich country and heavy feeding to enable them to produce good fleeces. The Lincoln cut the heaviest fleece, and was famous also for its lustre, but the quality was very coarse, and the price per lb. low. The English Leicester, next in order as regards weight of fleece, produced wool of finer quality and of slightly higher value per lb. than the Lincoln. The Border Leicester fleece was still lighter and finer. The Romney Marsh fleece was light, dry, and of harsh texture, and did not exhibit the lustre of the other three breeds. The constitution of the breed was its most important feature.

The Down breeds were briefly commented upon, and their entire unsuitability as wool producers explained. The wool was very open, short, and harsh, with no definite staple formation. On the body itself, the wool was not a good white colour, and the black points were a serious drawback, as much black wool and hair penetrated into the fleece growing near the head and lower limbs. The sheep would only cut 6 or 7 lb. of wool, which at, say, 8d. per lb., would not recommend itself to breeders as a wool proposition.

Mr. Major next discussed the three groups of breeds for their mutton characteristics. The Merino, generally speaking, was an inferior mutton sheep. Its bone was not extra heavy, and its meat not coarse, but the manner in which its rather badly conformed frame is fleshed did not appeal to butchers and exporters. Instances of high-priced fat Merino wethers could be quoted, but cross-breds in prime condition would always beat them. The Merino was a very slow maturer.

As mutton producers the longwools were better sheep, the carcases being more shapely, though rather long, and the flesh thicker over the bones. On the other hand, the bone was heavy and the muscle rather coarse. They were inclined to lay on much internal fat. The longwool studs in England and Scotland benefited greatly by the Australasian and Argentine demand for pure sheep. Here our stud longwool flocks act as depôts from which farmers purchase sheep for mating with Merino for cross-breeding. Were it not for this oversea demand, many of the longwool studs of Great Britain would be dispersed, as sheep are mostly valued at Home for their mutton qualities, in which direction the Down breeds are easily their superiors.

Looking at the English farming conditions, they found a big meat-eating population which the home-grown mutton could not wholly supply. The agricultural areas were small, and intense culture was adopted. There, those who farmed sheep for the local mutton demand required an animal which would lay on a maximum amount of flesh in a minimum of time in return for the least amount of feeding, and in this respect the Down breeds surpassed all others. The Southdown, at the head of the group, represented the ideal mutton carcase. The flesh was fine in the grain and very juicy, the fat was

evenly distributed, and the bone extremely light and fine. The other Downs—Shropshires, Hampshires, &c.—give better all-round returns to the farmer, but none could beat the Southdown for quality.

The conditions of farming in Australia were very different to England. There was not the big population here, and our local mutton market was not of sufficient importance to merit the farming of these pure mutton types. We required something more—a good all-round sheep, a wool and mutton combination, and it was in this direction that the cross-bred was prominent.

Cross-breeding in suitable districts had come to stay. In New Zealand, only 5 per cent. of the sheep were Merinos; Tasmania had more than half cross-breds; and Victoria had about half of cross-breds and half of Merinos. The increase of the cross-breds was due to two factors: (1) the export mutton trade; (2) high prices ruling for medium and fine cross-bred wool. The masses to-day were wealthier than ever before, and the world was consuming more meat. Many of the European flocks were diminishing, especially those of Germany, where, in the last twenty years, the domestic flock had decreased from 25,000,000 to 5,000,000, and meat was an exorbitant price. These big European populations, and also those of the United States and United Kingdom, looked to the great pastoral countries of Australia and Argentine for their supply of frozen mutton, and if we were to cater for this demand it must be done with the cross-bred, by which he meant a Longwool-Merino cross. The high prices ruling to-day for fat cross-breds were due to the export trade, and most of the carcases found their way to the meat works in the metropolitan areas.

The Longwool-Merino cross also yielded a very profitable fleece; the progeny of the two breeds was very harmonious, as the characteristics of the two breeds blended admirably. The change of fashions, the demand for cross-bred wool fabrics, and the introduction of better machinery for dealing with cross-bred wool, were factors which enabled wool buyers to give higher prices now than formerly.

Cross-breeding offered many advantages, but at the same time it had its faults. On a big scale, as was undertaken at Bolinda Vale, 30 miles from Melbourne, where up to three years ago 50,000 English Leicester-Merino cross-breds were annually shorn, the advantages were many. By a well-defined system of mating, big flocks of all the different grades were retained, and so they could supply any demand for a certain class of wool or mutton in big lines. On the other hand, the farmer, with an area capable of running 1,000 sheep, had usually to breed his first crosses; his wool-clip was of necessity a mixed one, and, after having obtained his cross-breds, he was faced with the question of how best to mate the first-cross ewes.

Farmers who contemplated cross-breeding should mate Longwools and Merinos, and then make the first cross, or halfbred, the basis of future operations. The Lincoln-Merino cross seemed most popular as a wool and mutton producer; but the Bakewell-type of English Leicester mated with the Merino is an excellent cross, and the same might be said of the Border Leicester-Merino cross. Farmers could not go far wrong in adopting any one of these crosses, but it was pointed out that success wholly depended on the original selection of the pure strains. From ill-shaped small Merino ewes and Longwool rams, which in many cases were not pure or true to type, the first crosses could not possibly be good, and all the crossing operations after must result in failure. The crossing of Down rams on Longwool ewes or Merino ewes was condemned. For those whose lands were suitable he advised the mating of the first cross ewes with the Dorset Horn or Shropshire rams for export lambs. It would be a boon to many sheep-farmers if many of the large estates would annually mate 6,000 or 7,000 of their old Merino ewes with Longwool rams, so as to supply big even lines of first cross ewes, and thus save farmers the bother and expense of breeding their own. He felt sure that the many Merino breeders in Riverina would profit by the venture, and doubted if they would have to hold the first cross ewes beyond the 2-tooth stage. On the other hand the first cross wethers would readily sell as fats.

Dealing with the conditions in the Wolseley Park district, Mr. Major said the country was more suitable for cross-breds than for Merino. On account of the wormy nature of the pastures, and also the fact that sheep in the district were very subject to fluke, he expressed the opinion that the pure Romney Marsh should thrive well, and instanced the prominent position this breed holds in New Zealand. He had seen on one farm a crop of maize averaging 8 feet, many of the plants being 10 feet high. Rape had also been grown successfully, and where such fodders could be grown lamb-raising might be undertaken.

A hearty vote of thanks was accorded Mr. Major for his interesting lecture.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

PHYLLOXERA-RESISTANT STOCKS.—"S.L.M.": It is not compulsory that vines planted within the Commonwealth be on phylloxera-resistant stocks. These stocks are not resistant to white ants. The Department recommends the grafting of vines on them, especially in districts which are infected with phylloxera, or in districts close to them.—M. BLUNNO.

STORING MAIZE COBS.—"A.S.": Maize cobs are often stored by putting them in a wire-netting bin with no roof, but it certainly pays to put a roof over them, as, if exposed to much rain, the cobs are inclined to mildew. By putting them in netting crates the cobs are air-dried, and this is a big advantage for storage purposes, but on no account should moisture be allowed to penetrate.—GEO. VALDER.

CATTLE SUFFERING FROM OPHTHALMIA.—"C.S.": You are recommended to bathe the eyes with a saturated solution of boracic acid in water, and then drop into them a few drops of a solution of hyposulphite of soda, 10 grains to 1 oz. Your subsequent reply that the cattle all showed a gradual improvement daily, and that even those that were quite blind now see a little, is gratifying.—VETERINARY OFFICERS.

ANALYSIS OF WELL-WATER.—"J.S.": The sample sent is chemically pure, but it contains numerous ciliated protozoa, one species of which is usually found in stagnant water. While none of these protozoa are specifically connected with disease, the boiling of all water for household purposes is advised.—F. B. GUTHRIE and G. P. DARNELL-SMITH.

WINTER FODDER CROPS.—"N.W.": The two best varieties of wheat for hay on a ridge on which there is no irrigation would be Thew for early maturity and Marshall's No. 3 for late maturity. As to suitability for green feed to be eaten off and then left for hay, Thew, Warren, Firbank, and Florence should be best. For the same purpose, with irrigation, Zealand, Marshall's No. 3, Huguenot, Florence and Firbank have so far done best under irrigation. Black winter rye could be sown from March to May. Under irrigation it is necessary to sow thickly in order to prevent the fodder from becoming too coarse. I would advise 1 bushel per acre drilled, and from 1½ to 2 bushels if sown broadcast.—GEO. VALDER.

SETTING OUT YOUNG PASSION VINES.—"G.A.S.": The season for planting out these vines is now well advanced, and I would suggest that they be planted out in the first week in September.—W. J. ALLEN.

FOWLS SUFFERING FROM "FAVUS."—"H.A.P.": Fowls that have a peculiar white blotchy scale on the face, comb, and wattles, are evidently suffering from "Favus," apparently a sort of scurvy eruption, but actually a parasitic fungus. The remedial measures are described in Bulletin No. 15, "Diseases of Fowls," a copy of which has been sent you.

If a laying hen be mated with a rooster and then separated, the last eight, ten, or twelve eggs will be fertilised and will hatch. If a laying hen be separated from one rooster and mated with another, an indefinite number of eggs will be fertilised by the first—sometimes six or eight, or more. Should a hen that is not laying and that is running with a rooster, be separated and placed with a new male bird, and should she then commence laying, the eggs will all be fertilised by the last rooster.—G. BRADSHAW.

LUCERNE IN THE FAR WEST.—"J.H.": Generally autumn is found the best time for sowing lucerne in the West, say from March till May, and red, sandy loam should be a good soil to grow it on. Generally an average of 12 lb. to 15 lb. of seed per acre is required. Seed can be obtained from any seedsman, the best being Tamworth, Mudgee, or Hunter River.—GEO. VALDER.

BEETLES DAMAGING PEACHES AND LATE APPLE BLOSSOMS.—"T.B.E.": The beetles forwarded by you have been identified as *Lagria grandis*, belonging to the family Lagriidæ, which contains only a few species. The one forwarded is the common species in Australia. It is often found upon the ground under trees or upon foliage of native shrubs, feeding upon the leaves, but seldom in numbers, and it has never before been recorded as doing any damage in orchards. The larvæ are short, thick set, shining, black creatures covered with short reddish hair on the upper surface, short antennæ standing out in front of the head, and the tip of the abdomen is produced into a pair of pointed spines. They are very active, crawling about among the leaves and rotting wood under the trees, and pupating under logs or stones. This is evidently a case of another native insect acquiring a new habit and food plant.—W. W. FROGGATT.

EARLY AND LATE WHEATS.—"C.W.": Early maturing varieties are varieties that mature quickly, and they should be sown late in the sowing season. Late maturing varieties are varieties that mature slowly, and they should therefore be sown early in the sowing season. In the North-western district, April is the best month for early sowing, May for mid-season, and June for late sowing.—GEO. VALDER.

WHITE ANTS AND FRUIT TREES.—"W.T." and "E.G.C.": Open out the soil and dig in a few pounds of kainit (German potash). It will keep them away, and kill a number by contact, at the same time acting as a good manure. Bi-sulphide of carbon would not last long enough; it would certainly kill all the white ants that came in contact with it, but if put too close might kill the trees too, and it would be expensive. Apterite is of little value in dealing with white ants. I have seen trees with the whole of the inner portion of the trunk piped by white ants, but the bark and sapwood alive and growing crops of fruit, the only danger being that they may snap off in a wind. I have known good bearing trees in this State which are almost hollow, but after they had been opened and cleaned out and the cavity filled with cement (forming a solid central column) trees have lived for years. Poisoned bran forced into a cavity in a branch or stem will sometimes attract and kill them. Mix 1 oz. of Paris green with 1 lb. of bran or pollard and a little water.—W. W. FROGGATT.

BONE-CHEWING.—"A.D.": For cattle affected with this disease give a lick composed of 10 to 20 parts of sterilised bone-meal, 40 parts of salt, 10 parts of lime, and 1 part sulphate of iron.—VETERINARY OFFICERS.

Later, this correspondent wrote that he considered the iron most important, and the lick as a whole acted as a great tonic; he also considered that by giving the lick the trouble had been quite overcome. There have been no losses since the cows took the lick.

CLEARING WITH TRACTION ENGINES.—"D.H.G.": It is difficult to give directions how to clear with a traction engine, as so much depends upon the class and size of the timber. Generally the best method is to use two engines with a connection wire rope, by means of which a number of trees are pulled down together. In the case of a single engine it will be difficult to work except in pulling down trees singly. In this case a wire sling is attached to a tree at a suitable height, and a long cable is attached to this and to the engine.—GEO. VALDER.

SMALL RED INSECTS ATTACKING FRUIT TREES.—"J.B.P.": The insects sent, which you say are attacking the limbs and stems of fruit trees, massing in clods about the stem, are the egg stage of the spinning mites, *Bryobia pratensis*. Later they will swarm over the trunk and stems in thousands. The best spray is lime and sulphur wash, applied as soon as the foliage is off the trees.—W. W. FROGGATT.

SOWING ALMOND SEEDS.—"J.H.C.": It is necessary to bud and graft almond seeds according to variety required and the time of the season for working. Grafting is performed in the early spring when the sap is coming up—budding in the summer and autumn months when the sap is flowing. For keeping and sprouting almond and walnut seed until ready for sowing in the spring, throw sand into the bottom of a box to a depth of one inch; then a layer of nuts, and another inch of sand, and so on until within an inch or two of the top. Water well with a sprinkler, and repeat the watering during the winter whenever the sand gets too dry. The sand has to be pretty well saturated with water, especially from the 1st July down to planting time, which is in August and September. The nuts are planted in drills and covered to a depth of 2 or 3 inches.—J. G. R. BRYANT.

SUN-HEATED WATER FOR DUCKS.—"T.A.A.": Ducks rarely have any disease, and when trouble such as you describe occurs, it is usually due to insufficient shade, or sun-heated water. When affected from these causes they lose the power of their legs and stagger about; the nostrils become watery and the eyes gummed up. Most of those affected die, and when any do recover they are of little account. If supplied with bran and pollard mixed fairly dry, cool water beside the food and some green stuff and meat, and also provided with shade, ducks should do well.—GEO. BRADSHAW.

BANKS OF IRRIGATION CHANNELS.—"J.P.T.": Either Rhodes grass or paspalum would be suitable to grow on the banks of irrigation channels.—W. J. ALLEN.

Orchard Notes.

W. J. ALLEN.

APRIL.

Harvesting.—The work of picking, packing, and marketing apples will continue this month; also the storing of any late apples or pears in either cool stores or cool store-rooms in the orchards.

Green Manuring.—If this crop is not already in, it should be put in now with as little delay as possible, wherever such crop is to be grown among trees and vines. The soil in most of our fruit-growing districts has had a fair soaking, and consequently the seed will germinate quickly after sowing.

Planting.—Planting of citrus trees may be continued this month. Where autumn planting is practised, care should be taken in handling such trees not to expose the roots to either wind or sun. Those who intend planting out new orchards should get the land cleared and subsoiled as soon as possible, and trees secured. In buying apple-trees, see that they are all worked on blight-proof stocks, as the roots of trees worked on such stocks will not be affected by woolly aphis. In order to ensure proper fertilization, it is better not to plant more than two or three rows of any one variety side by side. Alternate rows of good commercial varieties that bloom at the same time should be planted.

Refills.—The ground should be well worked up where such trees are to be planted in established orchards, and if the soil is poor or hard it would be as well to remove a load or two of the poor soil, and fill up the hole with good soil if there is any handy. Before filling up with this soil it would be as well to sprinkle a few pounds of lime in the bottom of the hole. This will assist in sweetening the ground.

Scales on Citrus Fruits.—If there are any citrus trees on which the fruit is dirty, it would be well to fumigate immediately, if the trees are in good condition, as, if this work is done now, most of the scale will have fallen off the fruit by the time it is ready to be sent to market. Other States do not want spotted fruit, even though the scale may be dead. It is only those who have clean fruit who will be allowed to market it in New Zealand and the different States of the Commonwealth. Fumigating tables and information on fumigating may be had on application to the Department of Agriculture.

Codlin Moth.—Where bandages are used, they may still be kept on the trees, as, even after all the fruit is removed, an occasional grub finds it way to the bandages. All props should be removed from the orchard, and any grubs adhering to them destroyed.

Specimens of Fruit.

I have to acknowledge receipt of very fine specimens of apples, pears, and quinces from growers in different parts of the State: and from Mr. George Formby, of Wombat, a collection of apples, consisting of King David, Cleopatra, Granny Smith, Black Ben Davis, Rome Beauty, and Five Crown. Mr. Formby was a successful exhibitor at the Young Show, where he was awarded eighteen prizes for his different fresh and dried fruits. Most of the specimens sent in by growers were submitted without any description of the habit or growth of the trees, or any particulars whatever. I would therefore suggest, for the guidance of those who wish to submit such specimens in future, that they give a full description of the tree, when the fruit ripens, the name (if any) by which the fruit is known in the district, and any other information which may help myself or the orchardists in naming such fruit. Typical specimens should, of course, always be sent with a stem of average length.

Export of Apples to Germany.

The State Supervising Officer under the Commerce (Trade Descriptions) Act, has been advised by the Collector of Customs of a memorandum issued by the British Consulate-General at Hamburg, concerning the admission of fruit into Germany. The memorandum is to the effect that inquiries at the Botanical Department of the Hamburg State elicited the fact that each case of apples imported from oversea is not investigated, but only 2 per cent. in the case of barrels, and 4 per cent. in the case of boxes, of each kind of apple bearing the same mark are inspected.

The charges which are levied on the whole number of packages are as follow:—

For packages weighing under 35 kilos ... ... 10 pfennigs.
„ „ „ over 35 „ ... ... 20 „

From the above it is clear, as has several times been pointed out by the Consulate-General, it is not advisable for too large parcels of the same mark to be shipped to Hamburg, as in the event of the goods being found to be infected, the whole of that particular parcel is not allowed to enter.

The Artificial Ripening of Dates.

The Algerian date was introduced into the United States (Arizona and Calfornia) in 1900, but the fruit did not ripen properly on the tree. It has been proved that the dates may be ripened in twenty-four hours by incubation at a temperature of 43 to 49 degrees centigrade. It has now been found that in presence of moisture the fruit can be slowly ripened at the ordinary temperature.

A temperature of 43 to 49 degrees centigrade is equivalent to 109·4 to 120·2 degrees Fahrenheit.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Irish Short-horn.	Limerick Lad (imp.)	....	. .....	Berry . ..	*
Shorthorn ..	Pansy's Progress	Dora's Boy ..	Pansy 4th (im.)	Wollongbar Farm	*
,, ...	Imperialist ...	Florio	Lady Nancy of Minembah.	,, ,,	*
,, ...	March Pansy ...	Earl March .	Australian Pansy	Grafton Farm ..	*
Jersey ..	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ..	*
,, ..	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	,, ,,	*
,, ...	Elaine's Heir ...	Thessalian II ...	Wagga Elaine	Yanco Farm ...	*
,, ...	Jamaica Jack ...	Sir Jack ..	Rum Omelette (imp.).	Wollongbar Farm	*
,, ...	Royal Blood ...	Berry Melbourne	Calceolus ...	,, ,,	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie .	Berry Farm ...	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Wagga Farm ..	*
Guernsey ..	The King's Mirror	Calm Prince ...	Vivid (imp.)..	Swan Bay... ...	22 June, '13.
,, ..	Star Prince ...	Calm Prince ...	Vivid (imp.)..	Kyogle	28 Aug., '13.
,, ...	Sky Pilot ...	Prince Souvia ..	Parson's Red Rose (imp.)	Grafton Farm ...	†
,, ...	Prince Souvia ...	Vivid's Prince...	Souvenir(imp.)	Grafton ,, ...	†
,, ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Casino	22 June, '13.
,, ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '13.
,, ...	Sunshine ..	King of the Roses	Princess Vivid	Grafton Farm ...	*
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	Claudius (imp.)	Golden Star II..	Claudia's Pride (imp.).	Tweed River ...	12 Aug., '13.
,, ...	Trengwainton VillageFavourite (imp.)	Trengwainton Village Lad.	Wild Eyes ..	Berry Farm ...	*
,, ...	Good-bye ..	Western Duke...	Souvenir (imp.)	Casino	28 May, '13.
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Jones' Island ...	1 June, '13.
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (im.)	Pambula	1 May, '13.
,, ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Lismore	3 July, '13.
,, ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel (imp.).	Murwillumbah ...	10 Nov., '13.
,, ..	Prince of Warren Wood (imp.).	Kingsmoor Governor (1952)	Quail (7051)	Frederickton ...	1 May, '13.
,, ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Macksville ...	14 June, '13.
,, ...	Rosehill (imp.)..	Northesk (2073)	Faultless Footsteps (6132)	Raymond Terrace	19 June, '13.
,, ...	Duke of Orleans	Godolphin Arthur (1664)	Flower of the Preel 3rd (imp.)	H.A. College, Richmond	*
Ayrshire ...	Jamie's Heir ...	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ...	*
,, ...	Orphan Boy ..	Songster of Greystanes.	Rosamond ...	Glen Innes Farm..	*
,, ...	Wyllieland ... Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin (imp.)	Bratha 4th ...	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.

Department of Agriculture,
Sydney, 2nd April, 1913.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

SHORTHORN.—Duke of Hampton: sire, Royal Hampton 10th (imp.); dam, Flower Girl; calved 14th May, 1911; colour, red and a little white. Price, **£15.**

Flower Girl is by Dora's Boy from Forest Pansy. Forest Pansy is by Oxford's Forest King from Australian Pansy. Australian Pansy is by Airy Knight 2nd from Pansy 4th (imp.).

Flower Girl, on second calf, in thirty-three weeks, gave 4,513 lb. of milk, with a test of 3·7 per cent. butter-fat, and is still milking well. Forest Pansy gave 5,785 lb. of milk in forty-one weeks, yielding equal to 272 lb. of butter. Australian Pansy gave 5,822 lb. of milk on her first calf, with an average test of 3·8 per cent. butter-fat.

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—St. Michael of Wollongbar : sire, Trequean Mike (2103); dam, Polly 2nd of Roque Balan (imp.); calved 21st August, 1911. Price, **£40.**

Polly 2nd of Roque Balan (imp.) yielded 4,157 lb. of milk, equal to 235 lb. of butter.

* **Earl of Bath:** sire, Monsieur Beaucaire; dam, Miss Jasmine; calved 10th December, 1911. Price, **£35.**

HOLSTEIN COWS FOR SALE.

WOLLONGBAR EXPERIMENT FARM.

Name.	Date of Birth.	Sire.	Dam.	Price.
				£
Lolkje Field (not in calf) ...	12 Nov., 1904 ...	Garfield	Lolkje	20
Marjorie (in calf)	5 Sept., 1906 ..	Chairman	Margaretha ...	30
Fraulein Arama (not in calf)..	4 Feb., 1907 ...	The Hague ...	Dina's Douwe ...	25
Marigold (not in calf) ...	25 Feb., 1907 ...	The Hague ...	Margosa	25
Maggie Hague (in calf) ...	28 Aug., 1907 ...	The Hague ...	Maggie Obbe ...	30

H. C. L. ANDERSON, Under Secretary.

* This bull will be held until 21st instant, when, if more than one applicant, he will be balloted for.

Sowing Wheat where Maize Failed.

A FARMER on the North-western Slopes asked recently whether it was necessary to plough again a small area on the black-soil plains. The land was ploughed three times during last October and November, some of it to a depth of 7 or 8 inches, and the rest only 2 to 4 inches, but owing to the dry weather the maize which was planted did not come to anything, and he now wished to plant wheat. He also wished to know the earliest date at which it would be advisable to sow, and what variety.

The reply of Mr. G. Valder, Acting Under Secretary, was:—No, it is not necessary to plough the land again; in fact, ploughing at this time of the year often results in loss of too much moisture. All that is required is that the surface be stirred to prevent loss of soil moisture, and that before sowing the land should be well worked with a cultivator. As a rule, on the black-soil plains, the one-way disc cultivator gives the best results. If the soil is worked with this implement to a depth of about 3 inches it generally leaves the soil in excellent condition for sowing. As a rule, it is a mistake to plant earlier than April. Firbank is the best variety for early hay for this district; but as a dual-purpose wheat, Marshall's No. 3 has given the best results. On the red soil, Bunyip should give the best results for late sowing.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1913.

Society.	Secretary.	Date.
Cooma P. and A. Association	... C. J. Walmsley ..	April 2, 3
Coonabarabran P. and A. Association	... G. B. McEwen ..	,, 2, 3
Bathurst A., H., and P. Association	... J. Bain	,, 2, 3, 4
Hunter River A. and H. Association	... E. H. Fountain ...	,, 2–5
Wauchope P., A., and H. Society	... A. D. Suters ...	,, 3, 4
Cobar P. and A. Association	... D. H. Dunlop ...	,, 5, 6
Adaminaby P. and A. Association	... W. Delaney ...	,, 9, 10
Gloucester A., H., and P. Association ...	... S. J. Bignell ...	,, 9, 10
Quirindi P., A., and H. Association	... Geo. Fowler ...	,, 9, 10
Clarence P. and A. Society (Grafton)	... G. N. Small ...	,, 9, 10, 11
Orange A. and P. Society	... W. Tanner ...	,, 9, 10, 11
Dorrigo A., H., and I. Society	... W. R. Colwell ...	,, 10, 11
Hawkesbury District A. Association (Windsor)	... H. S. Johnston ...	,, 10, 11, 12

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1913.

Society.	Secretary.	Date.
Moree P. and A. Society	D. E. Kirkby	...April 15, 16, 17
Batlow A. Society	Tom Bowman	... ,, 16, 17
Dubbo P., A., and H. Association	F. Weston	... ,, 16, 17
Dungog A. and H. Association	C. E. Grant	... ,, 16, 17
Merriwa A. and P. Association...	V. Budden	... ,, 16, 17
Ulmarra P. and A. Society	R. N. Shaw	... ,, 22, 23
Upper Manning A. and H. Association (Wingham) ...	D. Stewart, junr...	,, 23, 24
Coonamble P. and A. Association	J. C. Wilson	... ,, 23, 24
Warialda P. and A. Association	A. J. Devine	... ,, 23, 24, 25
Richmond River A., H., and P. Society	D. S. Rayner	... ,, 29, 30 May 1
Kyogle P., A., and H. Society	M. P. Dunlop	... May 7, 8
Nyngan and District P. and A. Association	R. H. A. Lyne	... ,, 7, 8
Walgett A. Association	W. Neal ...	... ,, 21, 22
N.S.W. Sheepbreeders' Association (Sydney) ...	H. N. Bowden	... July 2, 3, 4, 5
Deniliquin P. and A. Society	L. Harrison	... ,, 17, 18
Peak Hill P., A., and H. Association	A. Yeo	,, 30, 31
Narrandera P. and A. Association	W. T. Lynch	... Aug. 5, 6
Murrumbidgee P. and A. Association (Wagga) ...	A. F. D. White	... ,, 19, 20, 21
Corowa P., A., and H. Society	John D. Fraser	... ,, 26, 27
Gunnedah P., A., and H. Association	M. C. Tweedie	... ,, 26, 27, 28
Parkes P., A., and H. Association	G. W. Seaborn	... ,, 27, 28
Ariah Park P., A., H., and I. Association	J. N. Taylor	... Sept. 2, 3
Wellington P., A., and H. Society	A. E. Rotton	... ,, 2, 3
Manildra P. and A. Association	C. M. Podmore	... ,, 3
Germanton P., A., and H. Society	J. S. Stewart	... ,, 3, 4
Junee A. Association	T. C. Humphreys..	,, 3, 4
Young P. and A. Association	T. H. Tester ..	,, 9, 10, 11
Albury and Border P., A., and H. Society	W. I. Johnson ...	,, 9, 10, 11
Cootamundra A., P., H., and I. Association	T. Williams ...	,, 16, 17
Cowra P., A., and H. Association	G. S. Fisher ...	,, 16, 17
Murrumburrah P., A., and I. Association	J. A. Foley ...	,, 23, 24
Riverina P. and A. Society (Jerilderie)	J. Kennedy ...	,, 24
Hay P. and A. Association	G. S. Camden ...	,, 30, Oct. 1
Hillston P. and A. Association	S. J. Gordon	... Oct. 8

1914.

Guyra P., A., and H. Society	P. N. Stevenson...	Feb. 17, 18, 19
Inverell P. and A. Association	J. McIlveen ...	,, 25, 26, 27
Central New England P. & A. Association (Glen Innes)	George A. Priest...	Mar. 10, 11, 12
Armidale and New England P., A., and H. Assoc'n.	A. McArthur ...	,, 17, 18, 19, 20
Northern Agricultural Association (Singleton) ...	E. J. Dann	... April 29, 30, May 1.

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Agricultural Gazette of New South Wales.

Continuous Wheat Growing.

ITS RESULT AT COWRA EXPERIMENT FARM.

M. H. REYNOLDS, Manager.

IT having been decided to abandon the present site of the continuous wheat experiment, and to start afresh on another section on the Farm, the occasion is a suitable one for placing before farmers a few details and conclusions arrived at in connection with the experiment carried out from 1906 to date.

The land was cleared and broken up in 1906. The soil consists of a red clay loam of granitic formation, characteristic of a considerable area of wheat lands in New South Wales. In all, seven crops of wheat have been taken off in the seven years, and the reason for discontinuing the experiment on the present site is chiefly due that blacks oats and Saucy Jack have taken possession of the land to such an extent that but little wheat is now taken from the area, and the weeds growing thereon have become a menace to the clean adjoining areas.

This state of affairs has not been brought about by any want of care in the selection and sowing of clean seed. The records show, after a first cropping with Federation, Bunyip wheat from the stud bulks was used, and latterly, when stud bulks have not been sown, the seed has been thoroughly graded and freed from black oats. Perhaps it is permissible to surmise that, as the farm was once part of the town common, the miscellaneous assortment of stock depastured there at various times brought the seed from other parts and deposited it there. With the exception of that portion of land actually adjoining the continuous wheat crop, the remainder of the Farm is comparatively free from black oats. Evidently, therefore, there is something in the practice of continuous wheat growing which favours the spread of black oats in the land. Either it is the inevitable result of growing wheat each year, or the cultivation methods are faulty.

It is, perhaps, necessary to state that the general directions governing this experiment do not stipulate that an effort should be made to keep black oats and weed pests in check, though a manager would naturally do this unless otherwise directed; but from the accompanying table it will be seen that a number of cultivations were given which should tend to check and destroy the oats in the five or six months that separate the harvesting of one crop from the sowing of the next—a number of cultivations quite equal to what most farmers find time to give.

From 1906 to 1909 inclusive there is no record of black oats occurring in the crops in the section under review, but in 1909 Saucy Jack was very prevalent.

TABLE showing the Rainfall Distribution, together with Dates of Cultivation, in the period January to June, 1909 to 1912.

1909.			1910.			1911.			1912.		
Date.	Rainfall.—Points.	Date of Cultivation.	Date.	Rainfall.—Points.	Date of Cultivation.	Date.	Rainfall.—Points.	Date of Cultivation.	Date.	Rainfall.—Points.	Date of Cultivation.
January 5	26		Jan'ry 12 to 15	171	January 20 to 25, Ploughed.	January 1	8		January 1	20	Jan. 9, Ploughed.
,, 17 to 21	115		,, 22	82		,, 6, 7	31		,, 6	28	
,, 23	2		,, 28, 29	65		,, 12 to 15	181				
,, 31	50					,, 18	58				
						,, 23	20				
						,, 26	16				
February 1	25		February	Nil.		Feb'ry 4 to 7	83	February 13 to 24, Ploughed.	February 8	19	
,, 2	17					,, 10 to 17	102				
,, 19	23					,, 26	33	,, 25, Harrowed.			
,, 20	15										
,, 25 to 28	184										
March 1	40	Mar. 3, Ploughed.	March 7 to 9	75	Mar. 16, Harrowed.	March 1	11	March 25 to 28, Disked.	March 1	3	March 19, 20, Cultivated spring-tooth.
,, 20	20	,, 6, Disked.	,, 13, 14	203		,, 8, 9	145		,, 10	4	
,, 30	55					,, 14	32		,, 29, 30	20	
						,, 19, 20	106				
April 5	9		April 19	4	April 15, 16, Disked.	April 10	10	April 6 to 8, Ploughed.	April 7	3	
,, 14	8					,, 16, 17	43		,, 22	18	
,, 19, 20	10										
,, 27 to 29	76										
May 1	2	May 13, Disked.	May 18, 19	109	May 12, Harrowed, ,, 13, 14, Seed drilled.	May 12, 13	38	May 16, 17, Disked. ,, 18, Harrowed	May 30	6	May 22 to 27, Disked and harrowed. ,, 29, 30, Seed drilled.
,, 6	9	,, 14, Seed drilled.				,, 17	45				
,, 9, 10	27	,, 26, Harrowed.				,, 22, 23	28				
,, 16, 17	120					,, 27, 28	76				
,, 19	14										
June			June			June 8 to 12	52	June 7, Disked and twice harrowed.	June 10	70	
						,, 17	2		,, 11	42	
						,, 19 to 21	93	,, 26, Seed drilled.	,, 15	23	
									,, 24 to 27	90	
Total fall	256		Total fall	289							

NOTE.—Where rainfall is given from one date to another a fall occurred daily. Ploughing was done to a depth of 5 inches; disking, 3 to 4 inches; spring-tooth cultivating, 3 to 4 inches.

In 1910 black oats, Saucy Jack, wild poppy, and shepherd's purse were very much in evidence, the black oats being thick throughout the crop.

In 1911 and 1912 the same weeds were again strongly in evidence, black oats predominating. The weeds were specially prevalent on the poorer and unfertilised sections.

From the foregoing table it will be noted that during the months January to June in the years 1909 to 1911 there was a good precipitation of rain to aid the germination of any oats or other seeds in the soil.

In 1912 there was a distinct lack of precipitation, and but little germination took place.

Method of Harvesting the Wheat.

The whole of the seven crops were taken off with a stripper; hence a quantity of black oats would be shed, and another portion be scattered on striking the comb, but not such a great distribution as would occur with a harvester.

The section of land set apart for the continuous wheat experiment may be considered typical land of the district.

Scope of the Experiment.

The experiment is divided into three main sections, as follow :—

(1) Continuous wheat growing.
(2) Wheat and bare fallow in alternate years.
(3) Wheat after a fodder crop.

Each of these main sections is again divided into three subsections :—

(*a*) Where the straw is burnt after stripping the grain and before ploughing.
(*b*) Where the straw is removed by reaper and binder after stripping and before ploughing.
(*c*) Where the straw is not removed after stripping, but is ploughed in.

On each of these subsections, (*a*), (*b*), and (*c*), an equal number of plots is set apart for testing the value of simple or compound manures as against no manure. Although the experiment was commenced in 1906, other results were not comparable until 1908 on account of two different varieties of wheat being used, one on the continuous section and the other on the two remaining sections.

Results on the Continuous Wheat Section.

In the portion unmanured for each of the five years, the best yield has been obtained where the stubble was burnt previous to ploughing. The average yield for the five years in the unmanured section was 15·9 bushels, so that in 1911–1912 the yield was considerably below the average.

In the manured portion, in the majority of cases the best yield has been obtained when the straw was ploughed under, and in two years where the straw was burnt. This tends to show that the removal of the straw by the reaper and binder is not the correct practice.

TABLE showing Results from Manuring and Different Treatment of the Straw.

Year.	Continuous Wheat.		Wheat after Bare Fallow.		Wheat after Fodder Crop.	
	Best yield from unmanured plots. Treatment of straw.	Best yield from manured plots. Fertiliser applied. Treatment of straw.	Best yield from unmanured plots. Treatment of straw.	Best yield from manured plots. Fertiliser applied. Treatment of straw.	Best yield from unmanured plots. Treatment of straw.	Best yield from manured plots Fertiliser applied. Treatment of straw.
1908	19·6 bushels per acre.	24·7 bushels per acre. Superphosphate 90 lb. } per Sulphate of potash 30 lb. } acre.	18·8 bushels per acre.	21·7 bushels per acre. Superphosphate 90 lb. } per Sulphate of potash 30 lb. } acre.	19·6 bushels per acre.	22·5 bushels per acre. Superphosphate 90 lb. } per Sulphate of potash 30 lb. } acre.
	Straw removed with reaper and binder.	Straw ploughed under.	Straw ploughed under.	Straw ploughed under.	Straw ploughed under.	Straw removed with reaper and binder.
1909	28·4 bushels per acre.	31·7 bushels per acre. Sulphate of ammonia 60 lb. } Superphosphate 90 lb. } per Sulphate of potash 30 lb. } acre.	34·5 bushels per acre.	37·2 bushels per acre. Superphosphate 90 lb. } per Sulphate of potash 30 lb. } acre.	35 bushels per acre.	37·4 bushels per acre. Sulphate of ammonia 60 lb. } Superphosphate 90 lb. } per Sulphate of potash 30 lb. } acre.
	Straw burnt.	Straw ploughed under.	Straw ploughed under.	Straw burnt.	Straw burnt	Straw burnt.
1910	16·3 bushels per acre.	25·33 bushels per acre. Sulphate of ammonia, 60 lb. } Superphosphate 90 lb. } per Sulphate of potash 30 lb. } acre	26·4 bushels per acre.	28 bushels per acre. Superphosphate 90 lb. per acre.	27·1 bushels per acre.	29·1 bushels per acre. Superphosphate 90 lb. per acre.
	Straw burnt.	Straw burnt.	Straw ploughed under.	Straw ploughed under.	Straw removed by reaper & binder.	Straw removed by reaper and binder.
1911	6·53 bushels per acre.	13·33 bushels per acre. Superphosphate 87 lb. } per Sulphate of potash 30 lb. } acre.	15·82 bushels per acre.	18·53 bushels per acre. Superphosphate 87 lb. per acre.	15·42 bushels per acre.	18·53 bushels per acre. Superphosphate 87 lb. } per Sulphate of potash 30 lb. } acre.
	Straw burnt.	Straw ploughed under.	Straw burnt.	Straw burnt.	Straw burnt.	Straw ploughed under.
1912	8·49 bushels per acre.	24·9 bushels per acre. Superphosphate 118 lb. } per Dried blood 51 lb. } acre.	22·89 bushels per acre.	37·66 bushels per acre. Superphosphate 118 lb. } per Dried blood 51 lb. } acre.	28·59 bushels per acre.	37·38 bushels per acre. Superphosphate 118 lb. } Dried blood 51 lb. } per Sulphate of potash 14½ lb. } acre.
	Straw burnt.	Straw burnt.	Straw burnt.	Straw burnt.	Straw burnt.	Straw removed with reaper and binder.

NOTE.—Dried blood was used in place of sulphate of ammonia for the years 1911–12. The plot in the continuous wheat section, yielding 24·9 bushels per acre, was much freer from oats than the remainder, and provides a fair comparison with the wheat after bare fallow and wheat after fodder crop sections.

In every year a compound manure gave the best results, superphosphate always being present, sulphate of potash being present four out of five years, and nitrogenous manure three out of five years. In 1912, the compound manure, superphosphate and dried blood, gave the best yield. The average yield for five years was 24 bushels. It will, therefore, be seen that the 1912 result was approximately 1 bushel above the average.

The striking feature in connection with the continuous wheat experiment is that where manuring was practised the ploughing under of the long straw was the better practice, and where manuring was not resorted to the long stubble was better burnt. It will be noted that in 1912 the best manured continuous wheat areas yielded 13 bushels less per acre than the fallowed and rotation areas.

Results of Alternating Bare Fallows and Wheat.

In the portion unmanured the average yield for five years was 23·68 bushels, and the yield for 1912 was slightly below the average. It should be noted that the average return from the unmanured bare fallow and wheat section was lower than that of the manured continuous wheat section, from which it seems that it does not pay to fallow unless manuring is also carried out.

With regard to the treatment of straw in the unmanured portion of the bare fallow and wheat section, it will be observed, on a study of the table, that in the majority of instances the better practice proved to be to plough in the long straw. In the two years, 1911 and 1912, the burning of the long straw proved the better practice.

On the section where fertiliser was applied with the seed wheat after a bare fallow, the best results in the treatment of straw agree somewhat with those for the unmanured section. For the first three years the better practice was to plough under the long straw, but in the last two years better results were obtained by burning it. The average yield for five years in this section was 28·6 bushels, and the 1912 results were considerably above this. The average yield was 5 bushels better than from the unmanured section.

Wheat after Fodder Crop.

In the unmanured portion of the rotation section, the average yield for five years was 25·14 bushels, and the yield for 1912 was well above the average. In the majority of instances the best practice was to burn off the long stubble. Another important fact is that where manures were not applied, better results were obtained by growing a rape crop in alternate years with wheat than bare fallow in rotation with wheat.

In the portion manured, the average yield for five years was 29 bushels per acre, or slightly better than the manured section devoted to wheat after the bare fallow.

In connection with this rotation, it is necessary to explain that the fodder crop (rape) was not manured, and it was not fed off, but was ploughed under. During the growing period of the rape, shortly after the plants were strongly

above ground in the autumn, the land was cultivated; occasionally, a later cultivation was given. An experiment will shortly be started to test the results from feeding off the rape.

There appears but slight advantage in planting and ploughing under a fodder crop when compared with bare fallow as a means of dealing with the land in alternate years with wheat. If the general practice of feeding-off of the rape tends, on careful investigation, to reduce the yield compared with bare fallow—a result not expected—then bare fallowing, combined with the direct application of manure to the succeeding wheat crop, will be equally profitable and less risky than growing a fodder crop and ploughing it under. The risk in alternating a crop with wheat is the depletion of the available soil moisture. In the five years' test, however, it will be noted that the cropping of rape occupies the land until the latter part of July, and the ploughing is done shortly after in July. By such a practice, a slightly better yield is obtained than with the longer bare fallow when cultivation is starte in early autumn. Will this continue over a greater number of years?

One of the drawbacks to cropping each year is the difficulty of keeping the land free from weed growth, and this is especially so if the two alternating crops have somewhat similar vegetative and seeding periods, examples of which are found in rape and wheat.

Sawdust as a Mulching Material.

A correspondent on the North-western Slopes asked recently whether sawdust, mostly from pine timber, would be harmful if used as a mulching round fruit trees or in a vegetable garden. He had already tried it in a small bed for mulching carrots, and they were looking very well—much better than those mulched with manure.

To this Mr. F. B. Guthrie, Chemist, replied: Sawdust is an excellent material for mulching, and I have never heard of any injurious effects from its use.

To get rid of Docks.

To free the land from docks, the only plan is to sow strong growing fodder crops in drills, and to cultivate well between the drills. The best crops for sowing now in a cool district are rape and field peas, and of the two I think that rape is likely to prove the better. If this crop were sown in drills, say from 2 feet 6 inches to 3 feet apart and well cultivated, then fed-off with sheep, again well cultivated, and allowed to make a second growth to be again fed-off, it would do much to clean the land. If a further cleaning is thought necessary, the rape could be followed by a summer crop such as maize or sorghum for fodder, to be drilled in and cultivated between the rows; the land could then be prepared in time for sowing next autumn.—Geo. Valder.

Explosives in Agriculture.

SUBSOILING.

H. C. COGGINS, Assistant Inspector.

THE recent dry spell has brought home in a forcible manner the great necessity for conservation of moisture in the subsoil, especially in districts where the top soil is very shallow, and the subsoil a stiff and practically impervious clay.

Orchardists and market gardeners—in fact, most farmers—do not as a general rule vary the depth of their ploughing enough. Some don't go deep enough for fear of bringing too much subsoil to the surface; others don't believe in deep ploughing. But when we talk about deep ploughing we must consider the depth of the soil, for while in one case it may be a great advantage, in another it may mean bringing the subsoil to the surface, which is most undesirable. The great thing to avoid is continually ploughing at the same depth; this is where all the harm lies.

Hard-pan.

It stands to reason that constantly ploughing at the one depth creates a "hard-pan," and this hard pan acts as a water-trap. Instead of the water percolating through the subsoil, and thus dissolving the plant-food stored to a considerable depth, the moisture is practically confined to the top soil, and it is on this that fruit-trees, root and all other crops are in a very large degree forced to subsist.

Depth of Soil.

When we speak of the depth of soils, we are prone to consider only the character and plant-food available for crops in the top soil, but we most certainly should give a considerable amount of study to the subsoil also, for there should be the chief sources of plant-food, and there also should be the home of the roots of plants. The reason we find so many worn out paddocks is that the top soil has been exhausted of plant-food and organic matter, little thought being given to the fact that if the hard-pan was broken and the subsoil stirred in some manner, the depth of the top soil would be considerably increased, the soil aerated to a great depth, and the value of cultivation enhanced by the capacity of the soil to hold more moisture. When we speak of the "depth of soil," therefore, we should mean the depth that might be made available.

Root System.

When we come to realise that the results of all crops, whether maize, wheat, fruit-trees, or vegetables, depend on the root system, and the freedom

of the root system is of vital importance, and when we pause to consider the depths that these roots penetrate if encouraged, one is often astounded that any result could be obtained from crops sown on top of a hard and impervious subsoil.

It has been proved that in a porous and open subsoil the roots of wheat have penetrated to a depth of 4 feet, potatoes 3 feet, lucerne 40 feet, and maize 4 feet.

It naturally follows that deeply-rooted plants are more drought resisting, for their root area is not confined; on that account the fertility of the soil is not depleted so soon.



Subsoiling Demonstration at Mittagong Industrial Farm Home.
The Safety Fuse well light.

Mr. W. J. Spillman, agriculturist in charge of farm management investigations, Bureau of Plant Industries, U.S. Department of Agriculture, in a recent bulletin, says :—

"Plant-food is dissolved in water. While a plant is growing a constant stream of water flows up through it and evaporates at its leaves. For every pound of increase in dry matter made by the plant, from 300 lb. to 500 lb. of water flows up through it."

One has only to go into the majority of orchards in the Cumberland district and examine the roots of the trees to find that they lie very close to the surface. The orchardist will tell you that he is afraid to plough deep for fear of damaging the roots, but the main reason for the roots being so close to the surface is that they have not been encouraged to go down by loosening of the subsoil. Of course, one will always find small fibrous roots

near the surface, but I allude to the lateral roots. These lateral roots will go after the moisture every time, and if the moisture is confined to the surface there they will remain. Again, if the roots could penetrate down below, each tree would be dependent on its own area for its supply of food and moisture, and would not encroach on its neighbours.

Storage of Water.

It is estimated that in 1 inch of rainfall 23,000 gallons fall on 1 acre, and when we consider that it takes 400 to 500 tons of water to produce 1 ton of hay per acre, one can fully realise the vast amount of water that has to be stored and retained in the subsoil to grow crops with satisfactory results. It follows that it is of vital importance that, irrespective of constant cultivation, the subsoil should be brought into a condition necessary to enable it to absorb all available rainfall. If this is not done, and a good fall occurs, the top soil becomes waterlogged, overflows, creates a wash, and carries away valuable plant-food and, what is most valuable, good soil.

Drainage.

We all know what badly drained land is, and what it means to crops and to farmers. We also know that it does not necessarily follow that sloping land is well drained, or that flat land is badly drained. One may say that drainage is everything, and artificial drainage is not everything. An artificial drain often carries away water that should percolate and be absorbed by the subsoil, but owing to the compact nature of the subsoil, and the consequent inability of the water to penetrate it, this is impossible; consequently artificial drainage is resorted to. Not that artificial drains are not very valuable and necessary, but in a great number of instances subsoiling is really what is required, and where subsoiling is resorted to it has the advantage of not only draining the land, but of relieving it from what may be termed a constipated condition, besides enabling it to retain more moisture.

A further great advantage of subsoiling is that after heavy rains one is able to get sooner on the land, either to plough or to cultivate; the land drains quicker, and often valuable time is saved in this respect. How often do we see days and days wasted through not being able to get at important work on the land; and when we do get there, how many of us see "the wash" caused and gutters opened up, and have to cart soil back to its original place.

The Remedy.

When one is asked to consider any new proposition appertaining to farming, the first thought is: what is it going to cost? This most important item I shall deal with later, except for saying here that I have carried out a number of demonstrations in subsoiling with explosives in different parts of the State, and on different soils, and I find that subsoiling with explosives is by far the cheapest and best. One man can do the whole of the work;

horse and plough are required, and only a few tools, consisting of one 2-inch bullnosed auger, one tamping rod, and one pointed crowbar.

The explosive I use and would recommend is gelignite or blasting gelatine; it is handy, less dangerous, and not expensive.

In deciding to subsoil a paddock, the strength of the ground must first be ascertained, and a test hole is put down, about 2 feet, to get this. One must not expect to see an upheaval; this is far from what is required. If the earth is displaced to any extent it shows that the charge is too strong, and is liable to bring the subsoil to the surface; this must be avoided. As a general rule, I test with one plug, and usually I find this sufficient for good work. Of course some soils require only half a plug; it all depends on the nature and strength of the subsoil and hard-pan.



Subsoiling with Explosives at Mittagong Industrial Home Farm.
Note that the Explosion in the First Hole has just taken place.

After getting the strength of the ground, go ahead; bore the holes every 10, 15, or 20 feet apart, according to the strength of the subsoil, and about 2 feet to 3 feet deep.

Preparing the Charges.

In preparing the charges it is necessary to use ordinary care and common sense; otherwise they may hurt. In cutting the fuse, cut square across the face, not slanting, and allow about 4 inches to project above the ground; insert the fuse into the detonator, making quite certain that no sawdust packing remains in the cap. Be careful not to push the fuse well home. Leave a space between the conical shaped cap, which contains fulminate of

mercury, and the end of the fuse. Crimp the detonator on to the fuse at the end of the cap, and use the proper crimper for this purpose. Do not bite it on; it might bite you.

Gelignite is in a soft condition like soap. Bore a hole in it with the handle of the crimper, specially designed for the purpose; insert the detonator and tie the end, paper and all. This keeps the cap from slipping out. Lower the charge into the hole; tamp gently at first, but stronger as the surface is reached, making the hole compact and tight, which is very important to get a good result. Then cut the fuse in a slanting direction and insert a small piece of gelignite. This will save matches and temper, if there should be any wind about.

As the fuse burns at the rate of 30 inches a minute, there is plenty of time to stand back. If one man is doing the job, it is advisable not to charge and fire more than 25 shots at a time; otherwise he may lose sight of a possible misfire.

Effect of the Explosion.

There will not be a big report, as some expect; neither will there be a displacement to any extent of the top soil. Where a number of holes are fired together, the effect for a fraction of a second resembles porridge on the boil.

The vibration of the shot will be felt from 10 to 15 feet each way, and this is practically the distance the shattering of the subsoil extends. If one could take a section of the ground the fractures could be easily seen.

The Cost.

The following table will give some idea of the cost of subsoiling with explosives. I do not include labour, as this will depend on the rate paid, and also on the strength of the ground. Where conditions are easy, a hole a minute should be done; but where the hard pan is tough and the subsoil very compact, it may take five minutes. Preparing the charges and tamping the holes will take nearly 4 minutes per hole.

TABLE showing Cost of Subsoiling with Explosives.

Distance of holes apart.	Charge.	Number of holes per acre.	Number of lb. per acre.	Number of feet of fuse per acre in 3 ft. holes.	Number of detonators per acre.	Total Cost per acre.
Feet.	Plug.					£ s. d.
10	½	435	21¾	1,305	435	2 12 9
10	1	435	43½	1,305	435	3 14 6
12	½	302	15	906	302	1 16 6
12	1	302	30	906	302	2 11 6
15	½	194	10	582	194	1 3 10
15	1	194	20	582	194	1 13 11
18	½	128	6½	384	128	0 15 4
18	1	128	12⅘	384	128	1 0 7
20	½	109	5	327	109	0 12 9
20	1	109	10¼	327	109	0 18 0

Don'ts.

There are several "don'ts" to be observed, and it may be well to note a few :—

1. Don't smoke on the job.
2. Don't tamp with a metal tamper; use a wooden one—a broom-handle is excellent.
3. Don't tamp hard at first.
4. Don't, in the event of a misfire, untamp the hole, but put down another hole about a foot away.
5. Don't forget that you are using explosives, and get careless after firing a few shots .
6. Don't clinch the cap on to the fuse with the teeth.

I would advise intending subsoilers, if they have not had previous experience, to attend one of the demonstrations that are given from time to time by the Department, under the auspices of the various branches of the Agricultural Bureau, for, although the method is not difficult, ocular demonstration is always better than printed instructions.

Dry weather is the best time to subsoil, for the results are better then. When the soil is wet, the subsoil is liable to pug, and instead of shattering downwards and outwards, the explosive is liable to have an upward effect.

Advantages of Subsoiling.

Some of the great advantages of subsoiling land are—

1. Conservation of the rainfall in the subsoil.
2. The drainage will be far more satisfactory.
3. It is possible to get on the land quicker after rain.
4. Air and atmospheric heat can get to the subsoil and sweeten it up.
5. Roots of all crops are encouraged to go down, instead of spreading unnecessarily near the surface.
6. Increased growth and fruition of all crops on account of the lessened fight for moisture.
7. The fertilising elements of the subsoil are made available.
8. All trees and crops are better equipped to face a dry spell.

Treatment of Bone-chewers.

In the October number of the *Agricultural Gazette* appeared an article on Osteo-malacia in cattle in New South Wales, in which the good results obtained by feeding "bone-chewing" cattle on bonemeal were pointed out. Since then inquiries have been received indicating that farmers experienced some difficulty in obtaining sterilised bonemeal. As a result, the Stock Branch have arranged with Messrs. Paton, Burns, & Co., Manure Manufacturers and Merchants, 75 York-street, Sydney, to supply to farmers a thoroughly suitable form of sterilized bonemeal for feeding to affected cattle. Messrs. Paton, Burns, & Co. undertake that the bonemeal will only be prepared from picked lots of fresh bones. The price of this selected material will be 10s. per cwt.

Field Experiments with Flag Smut.

Bathurst Experiment Farm.

R. W. PEACOCK, Manager.

[Note.—In authorising the publication of this report, the Experiments Supervision Committee desire to draw attention to the fact that the results are for one year only, and herefore no conclusions can be drawn. It is felt, however, that the public are entitled to know the results as they are obtained.—Ed.]

During the past five years, particularly throughout the wheat belt of New South Wales, no disease affecting wheat (excepting perhaps "Take-all") has caused more discussion and called for more attention than flag smut (*Urocystis tritici*). This cannot be due to the idea held by some growers that the disease was not known previously, as its prevalence in Australia was certainly known in 1868, if not before.

Throughout the wheat belt of this State the disease is more prevalent than wheat-growers are aware. It is only within the last few years, since the disease has become so prevalent, that farmers have realised the damage it may do to a crop. Another point which invites attention is that the disease is gradually spreading each year, and this is seriously interfering with the quantity of wheat produced in the State.

As few growers are really familiar with flag smut, a brief description of how it affects the wheat plant may be of interest. The name "flag smut" will at once indicate to readers that it is a disease affecting the flag or leaf of the plant. The first symptoms will be noticed on the flag or leaves, in the form of long greyish streaks, which run parallel with the veins of the leaf. The streaks gradually become darker and more pronounced, and growth is seriously affected. The plants present a very unhealthy appearance; in most cases the ear does not form, and if it does the grain is small and usually shrivelled. As the season advances the plants gradually wither, and after a time die down. It is estimated that in parts of Australia, as much as 50 per cent. of a crop has been practically destroyed in this way.

Flag smut up to the present is a disease of which we in New South Wales have a very limited knowledge, and for this reason the Department decided that experiments should be designed and carried out at the various experiment farms, with a view to throwing a little more light on the subject.

The matter was placed in the hands of the Experiments Supervision Committee, who asked me to submit details for the carrying out of an experiment.

These were furnished as follow :—

EXPERIMENT with Wheat to investigate the Disease known as Flag Smut.

Number of Row.	Treatment.
1	No infection, and no treatment.
2	Infected by dusting with spores, and no treatment.
3	Infected as above, and treated with bluestone and lime-water.
4	Infected by distributing diseased flag in the row with the seed.
5	No infection, and no treatment.
6	Infected with horse manure, from horse fed on diseased hay, placed in the row with the seed.
7	Infected by horse manure, six weeks after germination, worked around the plants.
8	Infected by diseased leaves worked around the plants, six weeks after germination.
9	Infected by dusting spores, then treated with formalin.
10	No infection, and no treatment.

The objects of the above experiment were to determine :—

1st. Whether fungicidal treatment of grain upon which diseased spores are present, is effective when seed is sown upon soil free from the disease.

2nd. Whether the diseased flag from affected crops is capable of infecting diseased free grains with which it is brought in contact.

3rd. Whether the spores of the disease maintain their vitality, after passing through the horse as dung, and whether such droppings are capable of infecting paddocks.

4th. Whether the spores of the disease are capable of infecting young shoots of the plant when tillering, instead of infecting the plant only at early seeding stage.

The experiment was approved of by the Committee and carried out at this Farm during 1912, two plantings being made.

Preparation.

During November, 1911, several bags of plants affected with flag smut were collected from a growing crop of Cleveland wheat. These were chaffed with a steam-driven machine, bagged, and fed to a horse. To make certain the animal was thoroughly cleaned out before feeding on the diseased chaff, green lucerne was fed for three days. The animal was kept in a clean bare yard, where no grass or any other form of food was available. The horse was fed on the chaff cut from the diseased plants, and the dung collected and placed in a box each day.

Unfortunately the manure got very wet as the result of rain which occurred during the time it was being collected.

TABLE I.—Showing Result of Flag Smut Experiment No. 1.

Variety of wheat used, Cleveland. Date planted, 13th June, 1912. Germinated 27th June, 1912. One hundred grains sown in each row. These rows were 3 feet apart, and it is evident from the results that the probability of infection from one row to another was very slight. Diseased leaves and horse manure worked around the plants on 12th August, 1912.

Row No.	Treatment.	Germination.	Clean.	Diseased.	Per cent. diseased
1	No infection, and no treatment	83	83	.. ...	.....
2	Infected by dusting with spores, and no treatment.	79	62	16	20·5
3	Infected and treated with bluestone, 1 to 60, and then dipped in lime-water.	87	85	.....	.....
4	Infected by distributing diseased flag in the row with the seed.	78	58	17	22·66
5	No infection, and no treatment	78	78	.....	.....
6	Infected with horse manure, from horse fed on diseased hay placed in the row with the seed.	71	68	.....	.....
7	Infected by horse manure, six weeks after germination, worked around plants.	81	80	1	1·2
8	Infected by diseased leaves worked around plants, six weeks after germination.	76	74	.....	.....
9	Infected and treated with formalin, 1 to 400, for fifteen minutes.	72	70	.....	.....
10	No infection, and no treatment	73	73	.....	.....

TABLE II.—Showing Result of Flag Smut Experiment No. 2.

Variety of wheat, Cleveland. Date planted, 1st July, 1912. Germinated 18th July, 1912. One hundred grains sown in each row. Diseased leaves and horse manure worked around the plants on the 6th September, 1912.

Row No.	Treatment.	Germination.	Clean	Diseased.	Per cent. diseased.
1	No infection, and no treatment	81	81	.....	.....
2	Infected by dusting with spores, and no treatment.	81	53	25	32·05
3	Infected and treated with bluestone, 1 to 60, then dipped in lime-water.	41	40	.....	.....
4	Infected by distributing diseased flag in the row with the seed.	91	61	24	28·24
5	No infection, and no treatment	81	81	.....	.....
6	Infected with horse manure, from horse fed on diseased hay placed in row with seed.	85	83	.....	.....
7	Infected by horse manure, six weeks after germination worked around the plants.	86	86	.....	.....
8	Infected by diseased leaves, worked around plants six weeks after germination.	84	84	.....	.....
9	Infected and treated with formalin, 1 to 400, for fifteen minutes.	68	68	.....	.....
10	No infection, and no treatment	88	88	.....	.....

NOTE.—Where the total of the clean and diseased plants does not equal the number of germinated plants, it must be understood that the others have died. The percentage of diseased plants is based on the survivals.

Although the experiment is in its first year, the results of both sections are fairly consistent. It appears evident that fungicidal treatment of infected grain is effective in destroying the spores. This is borne out in rows 2, 3, and 9 of both experiments. It seems also evident that the presence of diseased flag in the ground will be a source of infection; even if the seed has been treated this will probably be the case. In districts where strippers and harvesters are used and the straw is ploughed under, infection may be caused in this way if flag smut be present in the crop. With regard to infection by horse manure it is possible that the fact of the manure getting wet interfered with the results.

Bunt in Thew Wheat at Glen Innes.

When the report on the harvest at Glen Innes Experiment Farm was written some time ago for the April issue of the *Gazette* no bunt had been observed in the crops, but when the wheat was graded a little bunt was found in the seed of Thew, though the seed had been carefully treated with Fungusine.

As bunt has been seen in previous years in this valuable green fodder wheat, it should be noted by those growing it, so that they may see that it is carefully treated before sowing with bluestone or some other fungicide.—R. H. Gennys.

Analyses of *Kennedya rubicunda* and Native Pea, for Fertilising Properties.

Under the impression that they might be used in many situations which are unsuitable for cowpeas, a farmer on the North Coast sent to the Department samples of *Kennedya rubicunda* and Native Pea for analysis. Reporting the result of the analysis, Mr. F. B. Guthrie, Chemist, wrote:—

Both samples became very dry in transit. The amount of water present in the fresh sample is probably over 80 per cent.

For the purpose of comparison, I append a table giving the composition of field peas examined in the Department's chemical laboratory, and of the two plants under discussion, all calculated to dry substance:—

	Field Pea.	*Kennedya rubicunda.*	Native Pea.
Nitrogen	4·81	1·66	1·84
Lime	1·31	0·60	0·42
Phosphoric acid ...	1·05	0·31	0·20
Potash	4·29	1·43	0·97

The field pea sample contained in its fresh state 88·6 per cent. water, and it will be observed that it contains much more fertilising matter than the plants now submitted for examination.

Waste on the Farm.

A. H. E. McDONALD, Inspector of Agriculture.

THE waste which takes place on many farms is very great, and if some farmers paused a moment to consider the annual loss on this account they would be very much surprised. This loss, while a criterion of the bountifulness of Nature, is very regrettable. Under harsher conditions, the farmer who failed to prevent loss would soon became bankrupt. Some farmers are met with who are extremely careful, judging comparatively; but the strict carefulness of the farmer who has gained his experience in the hard school of husbandry in the Old Country is rarely seen. The use of modern machinery, which has so cheapened production, is, to some extent, responsible. Crops can be produced cheaply, and a little waste is not noticed, and while this in itself is not of much consequence, it tends to breed carelessness in regard to larger things.

Loss in Machinery.

Loss takes place in many ways. The machinery equipment of a wheat-grower, working on even a modest scale, costs anything from £200 upwards, and much of it, such as harvesters, binders, drills, &c., is of a very perishable nature.

A harvester, for instance, which costs about £90, will, in the hands of a careful man, remain in good order, with slight expenditure on repairs, for ten or twelve years, while the writer has seen the the same machine last only five years where care was not bestowed upon it. Put this into £ s. d. The first farmer suffers a loss of about £9 per year through depreciation, but the second has a loss of £18, and thus loses £9 per year which might have been saved. The same applies to binders, and drills, and, to a lesser extent, to ploughs.

Loss in connection with machinery may be put down to three chief causes: (1) Exposure to the weather during the part of the year when they are not in use; iron implements, such as ploughs, &c., suffer little in this respect, but machinery in which wood is largely used, and where the iron parts are of finer construction, deteriorates considerably. (2) Failure to keep all parts tightly screwed together, thus permitting breakages and rapid wearing, and also much loss of time. A farmer in one of the wheat districts sent out an inexperienced hand with a drill last season. After an hour or so a nut worked loose; it was not tightened, and in a short time the pole was broken. This meant a loss of several hours whilst the damage was repaired. (3) Loss through neglect of lubrication. Modern machinery, from the plough upwards, has many moving parts, and when these are not well lubricated rapid wear takes place, and new parts have to be obtained.

Loss in Harness.

In the hands of the careless farmer, harness deteriorates very rapidly. The writer has seen collars last many years with good farmers, while in other cases they have had to be replaced in two or three years. The loss is chiefly due to neglect in respect of keeping the leather well oiled. If well looked after it is practically weather-proof, while if neglected it soon cracks and breaks. Collars are specially subject to deterioration. The horse develops a sore shoulder through bad driving or a badly-fitting collar, and a piece is cut out of the lining, so that the sore will not be touched. This weakens the collar, and it soon goes to pieces. In a few cases, the harness is even exposed to all sorts of weather when not in use.

Loss of Horse-flesh.

Nothing keeps a farmer down so much as poor horses. The loss in this respect is appalling. Not long ago, a farmer boasted to the writer that he had used only half the feed that his neighbour had in putting in his crop. He had saved about £25 worth of hay, he said. A few weeks after he had lost two horses, worth about £60, through severe cold weather setting in when they were in low condition. Through not feeding his horses well the cultivation was badly done, and his crop was a poor one.

Badly-fed horses are weakened constitutionally, and are more liable to disease, and they usually die prematurely. A well-fed horse rarely suffer from disease, and has a long working life.

Loss through Bad Fences.

Broken down or weak fences cause much loss. Working horses find a gap, and wander on to the road, and a day or so is spent searching for them. Stray cattle walk in and eat grass for which no agistment is obtained, or they find their way to a haystack, and pull out and destroy several pounds' worth of feed. Horses find their way into fields of ripe wheat, and gorge themselves and die. A valuable two-year-old, that is a bit frisky, gets tangled up in some loose barbed wire lying about, and gets cut up so much that he has to be shot. Not long ago the writer saw a valuable draught foal have a leg broken through getting caught in a wire fence enclosing a paddock in which it had been put by a careless farm-hand instead of in its right yard.

Heavy awkward rails are used for gates, and instead of egress or ingress being obtained in a moment several minutes are wasted. It would be interesting to know just what some gates cost, if the time taken in opening and shutting them was worked out at, say, 9d. per hour.

Loss of Produce.

It is hardly necessary to refer to the loss caused through failure to conserve surplus growth. Just one instance may be given, however. In 1910, many of the wheat crops in the North-west were destroyed by frost. Most of them were subsequently burnt or fed-off by stock. One business-like

farmer at once put the binder into the crop, and converted it into hay, and a couple of years later sold several hundred tons at between £5 and £6 per ton.

A great deal of loss occurs through lack of sheds for hay. A stack is built for feed purposes; the sheaves are pulled out as required; the stack opens up, rain gains an entrance, and a good deal of it is spoiled. The sheaves are thrown out to horses, which trample much of the hay into the mud. It is not generally known that horses eat a great deal more hay than they would if it were chaffed.

Seed-wheat is stacked without protection, and the fowls, the birds of the air, and the mice take a very liberal share.

These are only a few of the chief forms of waste that occur. Many more—such as time lost in looking for tools not in their right places, or through machinery not being overhauled until it is required for work—could be pointed out, but sufficient has been said to indicate the room for improvement.

It is attention to detail which spells success with the farmer as with every other business man. A glance at the farm will tell whether the owner is prosperous. On the well-managed property which is paying, as distinguished from the one which is merely providing a living, everything is spic and span. Often the difference between the farms of two men, who have had equal opportunities, is remarkable. One is well improved, the fences are good, gates are properly hung, windmills lift the water from the wells, barns and sheds are commodious, and the homestead is comfortable; while on the other everything is out of repair, and about the only building on the place is a small house. Improvement lies altogether with the man who manages the property. If he is careless, everyone about him is careless and slovenly.

A little healthy rivalry would do much to improve matters. A system which is practised in South Australia could with advantage be introduced here. There the members of branches of the Agricultural Bureau frequently arrange to hold their meetings on the farms of the members. The meeting is held in the house, or the barn, or other convenient place, and after the business is transacted a stroll is taken round the farm. If the gates happen to be hanging badly, or the binder shows signs of having had the fowls roosting on it, a little healthy criticism follows. The system has brought about marked improvement, and it would probably have the same effect here.

Paspalum after the Seed Harvest.

If paspalum is cut after the seed has been harvested, it only has about the same feeding value as straw, which it closely resembles. In this stage it contains a large percentage of fibrous matter, and is of very little value unless mixed with other fodders. One way in which it has been satisfactorily used is by turning it into silage by mixing it with other succulent fodders.—Geo. Valder.

Insectivorous Birds of New South Wales.

[Continued from page 323.]

35. Orange-winged Tree-runner.

THERE are seven species of "Tree-runners" in Australia, four of which are to be found in the southern portion of the continent. The one illustrated is nowhere more common than in the neighbourhood of Sydney, where it is also known as the "Diamond" or "Little Woodpecker." Mr. North states that "open forest lands, studded with the larger kinds of *Eucalypti* and *Angophoræ*, are its favourite haunts," but at Ashfield and Canterbury he has found it "breeding in isolated trees close to the principal streets. It is a resident species, and is usually met with during the autumn and winter months in small flocks, numbering from five to eight or more individuals."

Mr. Hall writes: "In contradistinction to the Tree-creepers, which move spirally upwards as they search for food, the Tree-runners work spirally downwards, the head towards the earth. Both genera, however, agree in so far as they both feed largely on hard-winged insects."

Mr. Campbell remarks that "it is interesting to note, as Gould has pointed out, that the genus *Sittella* contains the Australian representatives of the Nuthatches of the northern part of the Old and New World. One sees the family likeness in the pert little Sittellas. This bird's bill is well adapted for its work, being nearly as fine as the needle at the point, and very slightly upturned. Its coat is greyish, with a striped appearance derived from a dark-brown streak down each feather, under surface light grey, while it receives its vernacular name from the broad patch of rich rufus or orange across each wing."

That the bird is insectivorous in its habit all three observers affirm. Mr. Campbell relates: "I once watched a party of Tree-runners near Ringwood, hawking in the air for insects. The birds were in a small tree close to me, running along the branches, some descending head downwards. Every now and then a pretty bird would gracefully launch into mid-air and poise on its fluttering orange-patched wings in the centre of a revolving bunch of gnat-like insects. The many audible cracks from the tiny bill testified how quickly the prey was being captured. As the bird returned to the tree, another would take its place among the crowded insects."

The nest is usually built at the junction of an upright forked branch, and is a masterpiece of deception, being so covered with pieces of bark as to closely resemble the branch.

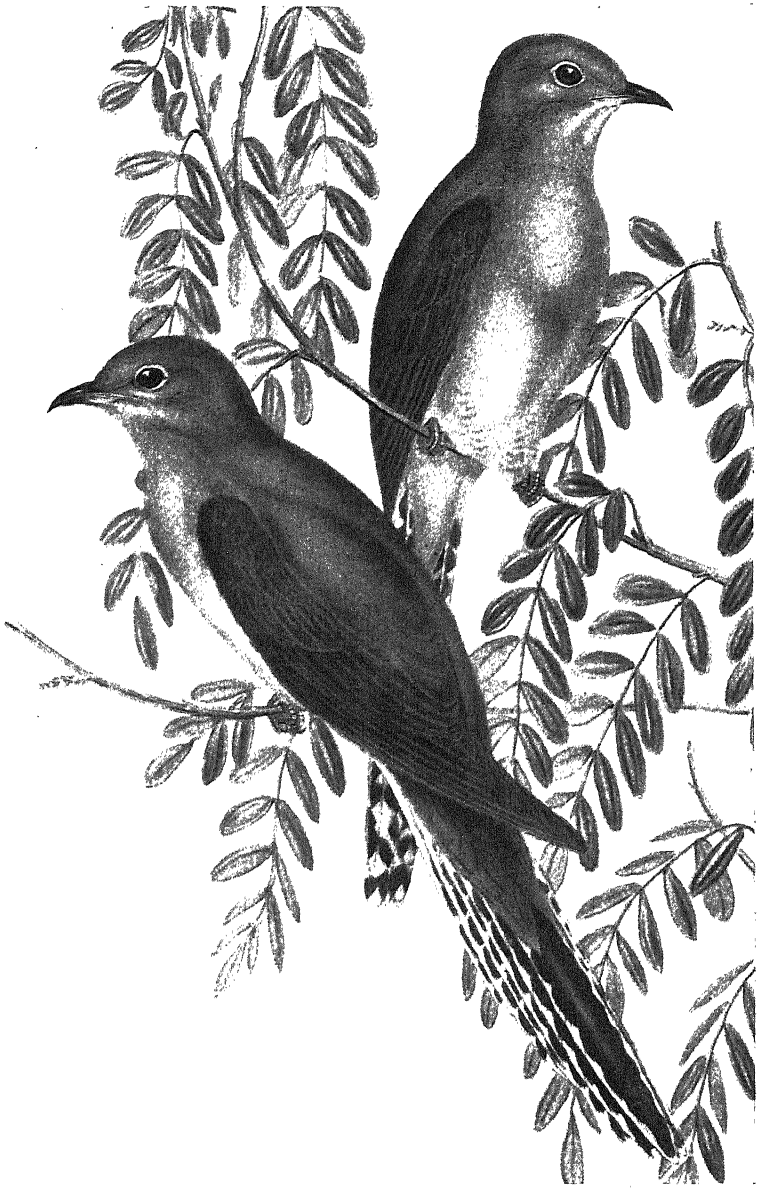
The eggs, usually three in number, are of a lustreless grey, blotched or spotted with black, that is also a reflex of the surrounding coloration.



INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"ORANGE-WINGED TREE-RUNNER."

Neositta chrysoptera, Latham.



INSECTIVOROUS BIRDS OF NEW SOUTH WALES.

"FAN-TAILED CUCKOO."

Cacomantis flabelliformis, Latham.

36. Fan-tailed Cuckoo.

Several species of Cuckoos are found in the southern part of Australia during the summer, their habit generally being migratory. That illustrated is one of the best known in New South Wales, and in the vicinity of Sydney it is a resident species, being present all the year round. It is of unobtrusive habits, making itself known by a low-pitched, mournful note, slightly resembling that of the curlew. It frequents open forest lands and cultivation areas, scrub and bush lands, and the wooded sides and gullies of mountain ranges.

Being parasitic, it has no nest of its own, but places its eggs in the nests of other insectivorous birds, leaving the foster-parent to hatch them and rear the young bird, which promptly ejects its foster brothers and sisters, so as to enjoy a monopoly of the food supply. Mr. Campbell records numerous species of the foster-parents, and believes that the female cuckoo watches her opportunity, laying her egg, and then carrying it in her bill to deposit it in the nest of her victim. One case is quoted by him of a Victorian observer, Mr. W. P. Best, who shot a fan-tailed cuckoo, and found in her gizzard an egg that had evidently been laid and then swallowed. "The conclusion I drew was that the bird had carried the egg about for a considerable time, and, being unable to find a suitable nest, had simply swallowed it."

The cuckoo is not a favourite with other birds, Mr. Hall gives the following statement of a friend of his:—"On the 30th August, 1897 . . . a pair of scarlet-breasted robins attacked an ash-coloured cuckoo, alighting together upon its head and back. They worried it for half a minute, the cuckoo not caring much, judging by appearances. When it flew away to catch a grub several yellow-rumped tits took offence at its presence and offered fight. Flying to a green tree, it was then beset by a white-shafted fantail. From there it flew to the ground. . . . I could not see it, but by the loud commotion among the scrub wrens it evidently was not welcome. Having risen again, it was attacked by the sordid wood-swallow in force and driven off. During the series of attacks it offered no defence, seemingly occupied alone in the search for its daily food."

This last is chiefly insects. The fact that the eggs are laid in the nests of other insectivorous birds is some evidence to that effect, but the following notes may also be given:—

"On the 21st July I saw one feeding in our orchard in Bellerive, perching on bare apple trees, and flying now and again on to the ground to pick up a grub or an insect."—Dr. Lonsdale Holden.

"The stomachs examined contained principally the larvæ of insects."—North.

The egg is white, thickly covered with fine grey or lilac spots, sometimes forming a zone or cap at the large end.

Winter School for Farmers, 1913.

Hawkesbury Agricultural College, Richmond.

The attention of farmers is invited to this Winter School, which lasts for four weeks, commencing on Tuesday, 24th June, 1913, and terminating on Saturday, 19th July, 1913. Farmers and graziers, or their sons who have worked at least one year on the land, are eligible for admission; the number, however, being limited to 100. A fee of £2 2s. is charged for the course, including board and lodging, &c., at the College. The fee is payable in advance to the Acting Under Secretary, Department of Agriculture, Sydney.

These courses are provided at the slack period of the year for busy farmers and stock-owners, who can devote only a limited time to study and intensive practical instruction. They are thus afforded the opportunity to acquire the greatest amount of directly useful information in the shortest time.

Railway passes are made available at two-thirds of the ordinary fare to all students attending the Winter School, for distances not less than 25 miles to and from Richmond, and are of six weeks' duration. The pass is obtainable on presenting a certificate signed by the Acting Under Secretary of Agriculture, stating that the holder is a student proceeding to the College to attend the Winter School.

The North Coast Steam Navigation Company, Limited, will also grant a rebate of 10 per cent. off saloon return fares paid by students of the school, on presentation of a certificate from the Department.

All students are to be subject to the regulations in force at the College. Each must provide himself with towels, sheets, pillow-cases, soap, and boot polishes. The College libraries, reading rooms, gymnasium, and recreation grounds can be used by students of the Winter School.

A programme of all lectures and outdoor work is placed on the College notice-board. Students are expected to select such branches of training as may be best suited to the conditions of their own districts and farms.

A copy of the syllabus, setting out the subjects upon which instruction is given, may be obtained from the Acting Under Secretary, Department of Agriculture, Sydney. Applications for entrance must be forwarded to the Acting Under Secretary not later than 31st May.

Milking Machines.

F. WIGAN, Dairy Instructor.

MILKING machines have of late years been very largely adopted by the dairymen of this State, and there is no doubt but that they will be more largely used in the future. The steady increase in their adoption is a practical indication that from the point of view of efficiency they are, to a certain extent, meeting the demands of the dairymen, although we hear of many who would prefer hand-milking if labour were procurable and reliable. It is not the intention in this short article to deal with the merits or otherwise of the different makes of machines on the market, nor yet as to their efficiency in milking the cows, but it may be wise to set out the chief points requiring most urgent consideration, not only by those about to instal machines, but also by those in whose dairy sheds they are already in operation. I trust that the farmers will follow this advice as closely as possible, and if this is done we can look for less second-grade cream from dairies using milking machines, and thus effect a big financial saving to the farmers and the State as a whole.

The most successful users are amongst those farmers who have their own lads and girls to assist in the milking, and who take a keen interest in the whole business; for milking machines, like most other machinery, require intelligent and careful handling.

Milking machines may be classed under three main headings:—

1. Vacuum machines,
2. Air pressure and vacuum machines,
3. Machines not using vacuum.

With the latter I have had no practical experience, but the success of all vacuum-using machines alike, as compared with the original L.K.G. machines, is the admission of air into the vacuum line by different machines in different ways, some admitting through the teat cup, others on the claw, and others again through the pulsators; and this has been the chief factor in making it practicable to milk the cows without injury.

Leaving the question of the effect of the machines on the cows for the farmer to decide before making his choice, we will go right on to what materially affects the dairying industry, and requires much more consideration than it has previously received, *i.e.*, the effect of the machines on the milk or cream, and how to avoid inferior quality.

Unfortunately, a great amount of machine-drawn milk is not up to that high standard that it should be, and we frequently hear of complaints of milking machines tainting the cream and milk. A slight rubber taint may be noticed for the first few milkings, and I have noticed a taint from the oil engine when used too close to the milk or too carelessly, *i.e.*, not kept clean,

or when the engine exhaust is not properly disposed of by carrying the exhaust pipe clear through the roof. It is advisable that the oil engine and vacuum pump be partitioned off from the milk-receiving room, or room containing the separator and milk vat or milk releaser. These taints are physical ones, directly attributable to the machinery, and can be easily rectified with proper precautions when having the machines installed. More serious taints, however, are due to microbes of different kinds which accumulate and live in all seams, corners, &c., of any part of the machinery through which the milk passes, or comes in contact with, namely, teat cups, claws, rubber connections from claws to buckets, or overhead milk pipe, buckets, milk releasers, or tanks, if these parts are not kept thoroughly clean at all times. Metal parts are fairly easily kept clean, but once the rubber becomes contaminated and neglected, it is very difficult to thoroughly cleanse it, and thus milk at all subsequent milkings becomes contaminated with the particular germs which have fastened themselves in these parts. It is thus seen that the milking machine is an additional home for harmful microbes on the farm, if not systematically and thoroughly cleaned; at the same time the milking machine is a means, when carefully and thoroughly handled, by which the farmer can produce an article of very high standard, as it affords a means of prevention of contamination from foreign matter and germs. Unfortunately, milking machines lend themselves to the faults of the careless producer, and it is then that bad results ensue.

A brief outline of the way in which to handle the machines on the cows, and their care and cleansing after use, will be of value. We will assume that the plant has been properly erected, having due regard to facility in operating. That is to say, the piping should be placed in a convenient position, with a fall of at least 3 inches from the furthest end of milk pipe into the milk releaser, and the releaser in a milk room outside the milking shed proper, and the engine in a room separate, or properly partitioned off from the milk room. I advocate the use of either double bails or the Echelon stall system: the former means two cows to each bail, and one machine to each bail; in the latter the cows are behind one another and side on to the milking passage. In each instance there is no obstruction between the milker and his cows, thus facilitating changing of teat cups from one cow to another, and also the stripping. To prepare for milking, place a clean milk can with strainer in the milk room at the end of the bails to receive the strippings, as, of course, the cows require to be stripped after the machines are taken off, and the massaging the teats receive during this process is beneficial. Then, also, keep a couple of buckets of clean cold water in convenient positions in the milking shed, having a clean cloth in each with which to wipe down each cow's udder, teats, and flanks, before applying the teat cups. This not only removes dust, &c., from the teats, and thus prevents same from being drawn into the milk through the teat cups, but also makes a more satisfactory joint to hold the vacuum, and thus the cups hold on better when first applied. Having quickly wiped the udders as directed, take the set of cups and apply to the teats in the usual way, taking care

that the teat goes straight into the cup and is not twisted; also, in long-teated cows be careful that the point of the teat does not go too far down, and thus get temporarily a hard blue point to the teat, which may start inflammation in the quarter. When the cow is milked out, or nearly so, can be judged by experience, by noticing the condition of the cow's udder, and the milk sight-glass. Now make a kink in the main milk rubber to shut off the vacuum, and with the other hand take hold of the teat cups and gently pull off same quickly, releasing the kink in main rubber to allow milk to be drawn out of cups instead of spilling on to floor; then turn round and apply the cups to the cow in opposite side of the bail, and strip out first cow. Heifers and short-teated cows, as a rule, milk out better and quicker to machines than aged cows.

Immediately the last cow has been milked, the cleaning of the machines must be started before any milk which is left in the tubes, &c., has time to dry and become hardened on. First take a bucket of cold or slightly warmed water, and a scrubbing brush, and wash the outside of each set of teat cups and any parts which may be splashed by the cows, &c. Then with another bucket of clean cold or lukewarm water, and starting at the bail furthest from the milk releaser, (in bucket plants it does not matter which one is done first) place the set of cups well into the water, then turn on the vacuum, withdrawing and immersing the cups quickly. A scrubbing motion is thus set up inside the teat cups and tubes, which will remove the traces of milk left in them. Having done all the sets in the same way, go over them in a similar manner, only this time using a bucket of clean scalding water with a little washing soda in it, and this will have the effect of removing any fat which is adhering to them. If steam is available the whole plant should be steamed through and it will then be found to be in a nice sweet and clean condition. This if properly carried out should be sufficient for a week, but at the end of each week all parts must be taken apart and brushed through, using cold water first, scalding water next, and steaming through; or if steam is not available, all rubbers must be boiled to make sure of removing the fat from them, which will help to preserve the rubber, since grease, oil or fat is very detrimental to the keeping qualities of rubberware. In releaser plants a brush fastened to a cord and inserted in the end of the milk pipe line and drawn through by the vacuum and back again by the cord will be the best means of keeping this piping clean. In all rubber tubing use a brush larger than the bore of the tube, in order to stretch the rubber and thus force out anything that may have got into the pores or creases of the rubber. Between milkings, remove all rubbers, connections and teat cups from the bail and keep in clean lime-water, using sufficient water to thoroughly immerse all parts, and keep in cool place; also open up the milk line so that it may get well aired or ventilated when not in use. Before using again, drain out the teat cups, &c., from the lime-water and rinse in scalding water. Lime-water requires renewing once or twice a week.

In the event of an inflation breaking whilst in work, and the milk getting behind it into the air line, it requires to be cleaned out as soon as milking is

completed; this is done by connecting the two lines and pumping water through them.

Special points for consideration :—

Take first the teat cups :—

See that the inflations are such that they can be easily cleaned.

See that the inside surfaces of inflations are smooth and therefore easy to clean.

It is essential that all rubberware should be of the very best quality, for if not, it will crack and fray, and create fresh seats for germs to accumulate in. The shorter the rubber connections the better, and in releasers I favour those which have large milk chambers and without floats inside, which make them difficult to clean.

In dairies sending fresh milk to Sydney, the cleaning of milking machines requires extra attention, and all parts want brushing and scalding every day, since for the milk supply the exclusion of all germs is necessary. Even the lactic germ which in cream is to a certain extent desirable, is in milk almost as undesirable as most others, being the germ which sours milk in the ordinary course of events.

Too much importance cannot be attached to the use of a scrubbing brush when washing all dairy utensils. Cloths and rags are not advisable.

If these simple means of handling and cleaning the milking machines are well carried out, we shall doubtless have much better reports from farmers and factory managers alike, with regard to the quality of the milk and cream drawn by milking machines, and also a big improvement in quality over the ordinary hand milking. Then milking machines will be recognised as a step in the advancement of the production of high quality milk, cream, and butter.

Milking Three Times a Day.

Experience has shown that cows that give very large quantities of milk will yield more milk if milked three times in the twenty-four hours instead of twice. If a cow is a large maker of milk, her udder becomes full long before milking time arrives unless she has great capacity in her mammary glands, and hence the animal suffers a certain amount of pain if allowed to go too long without being milked.

Under such circumstances a cow will give larger yields if milked three times a day, and the butter fat test will not suffer. In nearly all the American records the cows that produce such high yields are milked three times a day.—M. A. O'Callaghan.

Cost of Plant and Fittings for Cheese Factories.

MATTHEW WALLACE, Dairy Instructor.

INQUIRIES are frequently received by the Dairy Branch regarding the cost of plant and fittings for cheese factories, and for the benefit of those interested the following list and estimate of cost has been prepared.

For an up-to-date cheese factory the undermentioned articles are found to be necessary to ensure the proper and economical working of a factory dealing with from 1,000 to 1,500 gallons of milk daily :—

	£	s.	d.
8-h.p. boiler	80	0	0
2-h.p. engine	25	0	0
2 milk vats—750 gallons capacity	66	0	0
2 iron cheese presses with Sprague head continuous pressure	51	0	0
Pair curd knives	4	10	0
Curd mill	12	0	0
14 cheese hoops (40 lb.)	11	11	0
40 ,, (14 lb.)	24	0	0
Pair scales	7	10	0
Sundries—buckets, chutes, tester, &c. ...	20	0	0
	£301	11	0

Estimated cost of plant and fittings for a cheese factory capable of dealing with from 3,000 to 4,000 gallons daily :—

	£	s.	d.
12-h.p. boiler	120	0	0
4-h.p. engine	50	0	0
4 milk vats—750 gallons capacity	132	0	0
4 iron gang presses with Sprague head continuous pressure	102	0	0
2 pairs curd knives	9	0	0
Curd mill	12	0	0
28 cheese hoops (40 lb.)	23	0	0
80 ,, (14 lb.)	48	0	0
Pair scales	7	10	0
Steam tester	12	10	0
Sundries	30	0	0
	£546	0	0

The cost of a building suitable for handling the above quantity of milk would depend on the kind of material used in construction and the cost of freight and labour in the district.

A suitable building should be built for, approximately, £1,500, and would provide for a cheese-making room 30 feet by 40 feet, with a storeroom 15 feet by 8 feet and an office of the same dimensions on the right, and situated between the making-room and the curing-room. The curing-room should be 30 feet by 50 feet, with walls 14 feet high. At the end of the making-room a passage 7 feet wide running the full width of the building should separate the boiler and engine-room from the making-room.

The boiler-room and wash-up room should be at the end of the building furthest away from the curing-room.

The plan adopted in building should be simple, and lend itself to the convenient working of the factory.

In choosing the site, great care should be exercised as to position and facilities for drainage.

Soaking Seeds.

Some seeds, such as those of the Lucerne tree (*Sagosaste*), require either to be soaked or to have the outside skin partially burned before germination in the soil can be relied upon. Any other seeds which have a similar thick, tough skin, will be benefited by the same treatment. Such seeds are treated at the College by pouring boiling water over them, and then standing them in the water for twelve hours.

In the case of seeds like peas and beans germination is hastened by soaking in ordinary water. This is invaluable when such crops are being grown for an early market. The total germination of soaked and unsoaked is, however, much the same. This class of seeds, of course, has thinner and softer coats than the first mentioned.

Planting soaked seed in soil too dry to support growth always results in heavy loss.—A. V. Donnan, Experimentalist, Hawkesbury Agricultural College.

Correction.

In the April issue of the *Agricultural Gazette*, page 277, Mr. H. Ross, Instructor, in introducing the reports on the farmers' experiment plots for 1912, referred to the average wheat yield for the State last season as "only slightly over 10 bushels." That statement was founded on an estimate made in December last. After the *Gazette* was in the press a revised estimate was issued by the Government Statistician, in which the average production per acre was put at 13·8 bushels per acre.—Ed.

Ostrich Farming in America.

Report presented to the Government of New South Wales, 11th March, 1913, by MR. NIEL NIELSEN.

AMONG the most interesting of the newer industries that have become popular, as well as payable, in the United States is that of ostrich farming.

Not only has this industry been established in close proximity to many of the big cities of southern California and Arizona, but in the latter State large ranches have been purchased and converted from cattle country to the use of feeding these valuable, feather-producing birds.

Wherever I had an opportunity of doing so I visited these ostrich ranches and secured some information that may be of some value to our people in Australia.

America is handicapped, as far as the ostrich industry is concerned, by the fact that the only part of the country that is suitable for ostriches is the south-western corner of the United States and the northern part of Mexico.

The suitable areas are about two-thirds of the State of Arizona, parts of southern California, and small portions of New Mexico and Texas, although these latter two States are occasionally subjected to very cold "snaps" in all but their extreme south-western portions.

Ostriches cannot stand much cold weather, and as all the country east of the Rockies, as well as all the higher tablelands, are subject to extreme conditions of cold at certain times of the year, the area in which ostriches will thrive is a very small portion of the United States.

The State of Arizona possesses more ostriches than the whole of the rest of North America. The climate of this State is very similar to that of the western parts of New South Wales, but I should think that over the whole of our State, with the exception of the Mountains and the wettest portions of the Eastern Division, ostriches would thrive, and if properly kept and attended would represent a certain and profitable investment.

The ostrich farms at Los Angeles and Pasadena, which are fair examples of those in the neighbourhood of big cities, are used almost as much for show places as for the production of feathers, although the latter branch of their profit-making is undoubtedly the greater, particularly so at Pasadena, which is the larger; but owing to the restricted character of the areas of all these suburban farms, the ostriches are artificially fed, and, consequently, are not living under natural conditions.

In Arizona things are different. There the ostriches are kept under as nearly as possible natural conditions, and in enormous colonies.

Areas that have been in use as cattle ranches have been acquired where suitable, and have been stocked with ostriches. These ostrich ranches are either owned by local residents or companies, or by companies formed by the feather dressers of New York, in which city practically all American feathers are dressed for market.

While at Phoenix, Arizona, I took the opportunity afforded to visit several of these farms or ranches. One of those I visited, conducted by some Dutch farmers, is in use mostly as a stud farm for breeding stock for sale, while another is the largest farm in America, carrying over 5,000 birds in various stages from chickenhood to maturity. This ranch is owned by a New York company, and pays immense dividends on the capital invested.

The number of hands required to run a large ranch such as this is not much greater than the requirement for a small farm, especially if it is arranged on the principle—as all the large ones are—that the birds feed themselves.

Those I am now speaking of are all on irrigated land or land that may be irrigated in part.

I visited these Arizona farms in company with two practical men. The managers also afforded me all the information possible, and showed me the details of the working of up-to-date ostrich ranches.

All the large ranches are irrigated from a main ditch running through the property, so that provision may be made for supplying water to the feeding paddocks which are alongside, and also in order that ample water may be provided in the run and feeding paddocks for the birds' drinking purposes, and to allow of their bathing when they so desire.

The feeding paddocks, or "corrals" as they are invariably called in America, are arranged side by side along the main ditch, and each run paddock has five or six feeding paddocks attached to it.

These feeding paddocks are from 6 to 10 acres in extent, according to the area of the run paddock to which they are attached, the idea being to have the total area of the feeding paddocks for each run paddock about one-third of the size of the run paddock; thus if there are six 10-acre feeding paddocks attached to one run paddock, or a total area in feeding paddocks of 60 acres, the run paddock will be about 180 acres. On some of the ranches the whole of the run paddocks are used as combined run and feeding paddocks, but the best results are secured from having separate run and feeding paddocks, although there should be some kind of strong-growing perennial grass planted in all the run paddocks.

The feeding paddocks are only made available one or two at a time. They are planted with various leguminous plants, such as alfalfa (lucerne), clovers, field-peas, or cowpeas; while some are kept for cereals, such as barley, oats, wheat, and millets of various kinds; the idea being to have some kind of green feed all the year round.

Lucerne is the main stand-by among the legumes, and barley and the millets among the cereals for winter and summer feed respectively. The run paddocks are sown with some kind of hardy perennial grass that will grow without much irrigation. If irrigated, this portion of the land is only as a rule subjected to what is called "wild flooding."

All the paddocks that are irrigated are allowed to dry well before the birds are allowed in, as the ostrich does not thrive with wet feet.

The men looking after the birds see that their water supply is kept up, collect the eggs and any loose feathers lying around daily, look after and at once isolate any birds showing signs of sickness, and so on.

When any of the birds are fit to be plucked the mob containing them is driven to the plucking crushes. As each bird is to be dealt with, a bag, in the form of a large stocking, is put over its head, when it at once submits to any operation that is necessary to denude it of its valuable feathers, which are invariably clipped, although the operation is called "plucking."

The idea in the minds of many people that ostriches "mate" for life has been quite exploded on these large ranches. If two birds of opposite sexes are kept together for any length of time they will form a sort of attachment, but let either one out among the flock on the ranch and they at once take a freer view of their duties in this respect.

The greater number of birds in the Arizona ostrich farms are of South African stock and type, but it has been recently demonstrated that an infusion of Nubian or Red-necked blood has increased, not only the physical stamina of the birds, but also their capacity for producing valuable feathers.

The ostrich breeder has always to contend against the possibility of a proportion of his young birds reverting to the wild type, and thus, while, perhaps, producing an equal weight of feathers per year, producing them of an inferior quality as far as the greater proportion is concerned.

Although the birds having the most valuable feathers are the ones utilised for breeding, still there seems a tendency in the progeny to get back to a more mediocre type.

Experts say that this is largely because the breeding of ostriches in captivity on scientific principles has not yet extended over a sufficient number of generations to fix the improvements that have undoubtedly been made in their feather-producing capacity by careful selection. In this regard there is yet great work to be done by those who thoroughly understand the art of type-fixing in animals.

In selecting breeding birds, too often are the males only carefully selected, while the inferior females are less carefully culled out. In this way, too, much reliance is placed upon the power of the male animal to reproduce his kind from inferior females, and while the resulting birds are usually better than their inferior maternal parent, it takes many generations to get the inferior points of the progeny brought up to even a fair standard.

To breed first-class ostriches a good type of female bird is more important than a good male type, and this is especially so at present owing to the types, even in the best males, not having yet become permanently fixed.

All the eggs proposed to be used for hatching are first carefully selected and numbered or marked according to parentage, and after this is completed their numbers are again reduced by excluding all but the largest and most correctly formed; the rejected eggs are sold to those who work them up into ornamental or useful articles.

The ostriches are all kept in mobs or flocks, according to age and ability to agree. Those of similar age have often to be divided into several small flocks because of their fighting propensities, and their general practice of worrying the weaker members. It often happens that birds of a previous season, or of the earlier breeds of the same season, have to be put back, according to their size and general physical condition, among younger companions; while particularly aggressive, specially developed, or quarrelsome young birds have often to be paddocked with their seniors to reduce them to a reasonable state of conduct.

The feathers, when taken from the birds, are roughly classed by girls, and are tied in bundles weighing from about ½ lb. to 1 lb., and are sent direct to New York, to be made into the feathers of commerce.

The eggs are hatched in incubators, and the young are thus never in the care of their parents. They are kept in what is called the "chicken-run," and are specially cared for until old enough to be put out to "shift" for themselves in the large ranch paddocks.

The ostriches are valued, not from the point of view of general appearance, or from their productivity in feathers, but from their producing power of the higher grades of feathers, the inefficient in this regard being constantly weeded out, and too often sold to the inexperienced inaugurators of new ostrich farms.

Good birds require no more food or attention than mediocre or inferior ones, and as there is a tremendous difference between the annual returns from the best birds and even the second grades, it is more important to keep only the best in this class of farm stock than it is in any other. The ostrich has only one use—feather production—while any other class of farm-bred stock has alternative uses to which it may be put; and this makes it all important from the point of view of those entering the industry that they should rigidly exclude from their early purchases all but the very best birds obtainable.

The ostrich lives to a great age—far longer than any other class of farm-bred stock—so, if a good start is made, and the farm managed with reasonable intelligence, the flocks are a practically permanent source of income, and the yearly increase when the farm is fully stocked may all be sold.

Although ostriches seem to be very free from diseases, they often suffer from injuries, received owing to their aggressive propensities and their habit

of stampeding, but such injuries, if attended to at once, very rapidly repair. A simple antiseptic is generally used, and is in most cases all that is required, unless injuries necessitating surgical treatment are received, and even these heal wonderfully quickly.

From my observations in America I should say that a large area of our irrigated lands might profitably be used for ostrich raising, but the farms should be situated in such a way that the irrigated land adjoins the dry area, that would be used for the run paddocks, in order that hand-feeding of the birds might be eliminated. I state this because from what I have seen, and from what is shown by the results of all the big farms in America, it appears that the ostrich thrives best if it can choose for itself its own hours of feeding and drinking, and this can only be secured if the feeding paddocks adjoin the run paddocks, so that the birds may help themselves from those of the feeding paddocks that are made available for their use.

I know nothing of ostrich farming, but record herein the information I have collected from those owning and conducting the farms I visited, many of whom are among the greatest experts in ostriches in the world.

Grasses for the North-West.

Johnson grass when young and in good condition is eaten fairly readily by stock, but should the weather conditions prove at all severe, the grass becomes very harsh and is then poor quality fodder. There is also a risk of cattle feeding on it suffering from poison, as it belongs to the sorghum family, besides which it often becomes a troublesome pest in cultivated lands, spreading freely and being difficult to eradicate. In most districts the disadvantages outweigh the advantages, and therefore we do not recommend this grass.

Phalaris bulbosa, known as *Phalaris commutata*, has proved a very useful winter grass for many of our districts. As a rule, however, it does not seed freely, and often it is difficult to obtain a stand from seed, and it has generally to be propagated by root division.

Of the introduced grasses, the only one that has given satisfactory results in the North-western district is Rhodes grass, which should certainly be worthy of a trial.

Of the native grasses, those that so far have given the best results are: Mitchell grass (*Astrebla triticoides*), Sugar grass (*Pollina fulva*), Blue grass (*Andropogon sericeus* and *A. intermedius*), Wallaby (*Danthonia semiannularis*), Weeping Love grass (*Eragrostis pilosa*), Windmill grass (*Chloris truncata*), and Blue Star grass (*Chloris ventricosa*).—Geo. Valder.

A Disease of Bees

Popularly Known as "Isle of Wight Disease," and Due to *Nosema apis*.

G. P. DARNELL-SMITH, B.Sc., F.I.C., F.C.S.

The presence of *Nosema apis* has recently been detected in bees from several districts in New South Wales. This parasite was first described by H. B. Fantham and Annie Porter in 1906, as giving rise to the so-called "Isle of Wight" disease. These authors have continued their observations, and have recently summarised them in the "Annals of Tropical Medicine and Parasitology," Vol. VI, No. 2, 1912.

In compiling the following notes, free use has been made of the work of these authors, to whom we wish to acknowledge our indebtedness.

Symptoms of the Disease.

There is no great outstanding feature common to all infected hives. Generally, examination of the ground and grass around the hives shows a number of bees feebly crawling about, and exhibiting no desire to sting if molested. The abdomens of the bees are often distended. Bees normally defecate when on the wing, but nosema-infected bees are, according to Fantham and Porter, incapable of so acting. Those, however, which we have kept under observation, defecated when on the wing, but many afterwards fell to the ground and crawled about in an aimless manner, eventually dying. Microscopical examination of the excrement of a nosema-infected bee shows from a few to thousands of tiny oval shining spores of the parasite, mingled usually with undigested pollen. The nosema-infected bees defecate for preference when stationary, and hence the soil and herbage adjacent to the hive, the alighting board, and even the combs and honey itself may show splashes of fæcal matter which microscopical examination shows to be highly infective, owing to the presence of the spores of the parasite. Bees infected with the parasite may leave the hive in search of honey, only to collapse at a distance from the hive, to which they never return. Thus an owner may lose a number of hives without even actually seeing a dead bee about. We have heard it stated in some localities that the bees are suffering from the "D.T's," which is short for the "Disappearing Trick."

Distended abdomens, dysenteric discharges, falling from the alighting board, and a sort of paralysis and dislocation of the wings, are symptoms of the disease sometimes observed. Healthy bees attempting to cleanse infected bees become themselves infected.

Parts of the Bee Attacked.

Nosema attacks the alimentary canal of the bee. The alimentary canal of the bee consists of the œsophagus, crop, chyle, stomach, small intestines, and large intestines. Nosema is found principally in the chyle stomach and the small intestine to which it gains access by the mouth, the spores being swallowed with food or drink. The parasites have been found in the fluid (the hæmocœlic fluid) which bathes the viscera of bees, so that there is the possibility of their extension into various organs.

The Effect of Nosema on the Alimentary Canal.

After being swallowed, the spores give rise to tiny germs or amœbulæ. These creep over the lining of the honey stomach and enter some of its cells. They are far more common in the chyle stomach. Patches of infected cells are the result; the diseased tissue appears torn and disentegrated, and as it is unable to produce its natural secretions, derangements of the digestive process follow.

Parasite Carriers and Immunity.

It is no uncommon thing to examine a number of dead bees without finding spores, and then suddenly to encounter an infected specimen. Again, the examination of a number of healthy bees may result in the discovery of one or more showing no marked difference from the other inmates of the hive, but yet carrying young stages of spores or nosema. Such parasite carriers may become very dangerous to the community of which they are members, should conditions alter and react unfavourably upon them. Some bees have survived attacks of the disease, and have become partially immune to the parasite; but when unfavourable conditions set in the parasite overcomes the resistance of the host, and the latter succumbs. Hives that have recovered from an attack of nosema always present this danger.

Morphology, and Life History of the Disease.

Nosema apis is a minute organism belonging to the protozoa. One phase of the parasite takes the form of very resistant oval bodies termed "spores," which serve to infect new hosts. Nosema is therefore put in that section of the protozoa known as *Sporozoa*. The spores are very small, and have a somewhat complicated structure, a feature which places the parasite in the group "Microsporidia," and the disease to which it gives rise in bees has been named by Fantham and Porter "Microsporidiosis."

From the resistant spore there issues, when swallowed by the bee, a tiny amœboid germ. This amœboid germ, by division, gives rise to two or more daughter forms, which move about over the cells of the bee's gut, or between the cells, or they may enter them. These motile germs are called "planonts." Having entered a cell the planonts come to rest, and lose their motility. They are now known as "meronts." These meronts give rise to other meronts by division. Ultimately each meront forms a spore. Thus the life cycle is spore—planont—meront—spore. Each planont may produce other planonts

by division, and each meront may produce other meronts by division, hence from the original spore a large number of spores are finally produced. The deadliness of the parasite thus depends in part upon its power of multiplication within one host.

The Problem of Hereditary Infection.

Nosema bombycis, which is allied to *Nosema apis*, and which gives rise to the silk-worm disease, is known to be hereditary, and to be present in the ovaries and eggs of the silk-worm moth. Reasoning from analogy, one would expect *Nosema apis* to be hereditary also. Fantham and Porter have found *Nosema apis* in unsealed and sealed bee larvæ, and in very young bees, but have, from lack of material, been unable to settle the question as to whether the eggs are infected. We were unable to detect the parasite in the ovaries of two queen bees from infected hives.

According to Fantham and Porter, there is the possibility of an immune race of bees arising: "Certain experiments in cross-infection have shown that some bees may feed on honey containing thousands of nosema spores, and yet be unaffected by them. Such bees may be considered immune to the effects of *Nosema apis*." Probably many Australian bees are immune to the effects of *Nosema apis*.

Preventive Measures.

Since the spores of *Nosema apis* are extremely resistant, and appear to be little affected by such strong reagents as creosote and pure lysol, disinfection seems to be out of the question. Drastic as it may appear, the only effective remedy at present known is to burn infected bees, infected hives, and infected comb, and, where possible, the burning of straw scattered over the ground around the spot upon which an infected hive has stood, is to be recommended.

The uniting of two or more weak stocks of bees is a mistake. It is far better to sacrifice the first stock showing signs of the disease than to lose the whole apiary as a result of sparing the first set of weaklings. As in most parasitic diseases, generous treatment in the matter of food is a great factor in maintaining the vitality and resistance of the hives.

It is very generally held by bee-keepers in New South Wales that honey gathered in the late autumn aggravates the liability to disease, and that bees fed artificially with syrup are likely to emerge from their winter quarters in a far more vigorous condition than those that have been allowed to feed upon autumn-gathered honey. This can be accomplished by extracting the brood chamber as late in the year as possible, leaving the colony in an almost starving condition, and supplying them, after they have cleaned up the extracted combs, with sugar syrup.

Swiss Hornless Goats.

INQUIRIES were instituted a few months ago by the Department, under the direction of the Minister for Agriculture, on the subject of the hornless goats of Switzerland, which are considered one of the best milking strains of goats in the world, and particularly valued for their suitability for hard conditions. There is a considerable area in this State on which the goat is the only milking animal that can be carried, and the quality of the animals running in those districts could certainly be greatly improved. Whether the hornless goats referred to would be suitable for this purpose was one of the points that it was thought the information sought might enlighten.

The inquiries were made through the Agent-General in London, and the Commercial Agent for Australia in Cape Town.

The British Minister at Berne replied through the Foreign Office :—

According to information received from the Federal Department for Agricalture, there are three different breeds of hornless goats in this country. These are—

1. The white breed, of which there are two kinds, (*a*) Saanen or Gessenay goat ; (*b*) Appenzell goat.
2. The " chamoise " Alpine breed, known as the Brienz goat.
3. The Toggenburg goat.

All these breeds are held in high esteem in all parts of the country, both in the mountains and in the plains, and are excellent milkers. The Saanen or Gessenay goats are larger than those of the other breeds. They are allowed to graze out in summer, and eat rough hay during the winter.

The prices of animals required for breeding purposes vary according to the breed and quality of the animal. Thus a male goat costs from 50 francs up to 300 francs, a female from 20 francs up to 200 francs, and a kid from 5 francs to 50 francs.

I have heard from Dr. Ernst Carroll, Trade Commissioner for Australia, to whom I also applied for information. He sends me the three enclosed publications, which will no doubt be of use, and encloses a letter from Professor Dr. E. Keller, who is said to be a great authority on these matters. Professor Keller writes that the two best breeds are the Saanen and Toggenburger, and he believes that both might be well suited for Australia ; but he particularly recommends the Toggenburger, which it appears is largely exported.

Some years ago a number of Swiss goats were imported by the Cape Government, South Africa, with the object of crossing them with Cape goats, in order to improve the milking quality of the latter. Goats are largely bred in South Africa for milking purposes, as over a large area of country it is practically impossible to keep cows, the climate being too hot and dry.

Addressing the Commercial Agent for Australia in Cape Town, the Secretary for Agriculture at Pretoria wrote that "in 1899 three rams and twelve ewes of the Saanen breed were imported by the late Cape Government at a total cost of £167, landed at Cape Town, the cost of transport and freight alone amounting to £110. Shortly after their arrival, however, one ewe died. The remainder thrived well at the Government farm at Elsenburg, until attacked by fluke," from which they all eventually died. The Secretary added :—

So far as the Cape Province is concerned, it was found that both breeds (Saanen and Toggenburg) did well along the coast, if a little artificial food such as lucerne was supplied, and they are more economical feeders than cows. In cross-breeding them it was found that the cross with the bastard Angora succeeded better than the cross with the Boer goat.

Several issues of the *Agricultural Journal* of the Cape of Good Hope were forwarded by the Union Department of Agriculture, and from various articles in these publications a few particulars regarding these goats have been extracted.

The Toggenburg Goats.

The peasant weavers of the Toggenberg Valley have for centuries kept these goats entirely for their milking qualities, owning them only in twos and threes, and not in large herds. The kids of the best milkers are most valued, and any goat that shows deficiency in milk production is not called upon to increase the herd a second time, but is soon converted into mutton. Owing to the liability of cross-bred animals to revert to an earlier and inferior type, Swiss breeders are very careful to preserve the varieties distinct. Consequently the goats have reached a standard of excellence equalled in all probability by no other herds in the world; and this with no artificial feeding whatever, for, with the exception of a little coarse hay in winter, the goats are entirely dependent upon the pastures of the mountain sides The Toggenburg is described as attractive and striking in appearance, the colour being a peculiar shade of brown with regular white markings.

Writing to the Cape *Journal*, August, 1902, Mr. W. Konschel, Uitenhage, stated that he had imported six ewes and had found that three out of the four surviving ewes gave four to five bottles of milk each day, and this for four months after kidding, with appearance of milking for another three or four months. The milk was free from objectionable taste and smell, and thoroughly relished by Mr. Konschel's children. As to crossing with local goats, he could not speak; but the British Goat Society's Champion Medal and Challenge Cup had been won by a goat with Toggenburg blood on the father's side only.

The Saanen Goat.

The Saanen goat was produced in the Swiss Valleys under very similar conditions to the Toggenburg. Mr. Walter Rubidge, Graaf Reinet, Cape Province, imported a number into South Africa in 1903, and to the editor of the Cape *Journal* of August, 1906, he stated that he landed seventeen animals, the average cost of which was £12 per head. The change of climate made practically no difference to them, and two years after landing the nine he kept for himself were, to all intents and purposes, the same as when they were landed. They were not beautiful, but he was deeply impressed with them as milkers, and believed there was a great future for them in South Africa, particularly for people with small holdings.

At that time he had had them in milk two years, "and 1,500 (quart) bottles per annum is what the worst of them has given." To show how prolific they are, Mr. Rubidge quotes a ewe that gave birth to twin kids in July, 1905, one being a ewe; on the 25th June, 1906, that ewe kid gave birth to twins.

In response to an inquiry by the Commercial Agent for Australia at Cape Town, Mr. Rubidge wrote quite recently:—

In reply I have to say that I imported them (Saanen Swiss goats) in 1903. I picked them from the Stud Registered flock at Frankfurt, in Germany.

I found them very prolific breeders and most profitable. The average yield of milk from (say) twenty ewes, of all ages, is five (quart) bottles per day. I have some that have given up to nine and ten bottles, but they require exceptional treatment and feed. They will not do on our ordinary grazing if we get any drought—say of only 6 or 7 inches of rain. They keep in milk for three and even four years without a break.

Experiments in Vinification.

L. A. MUSSO, Chemist's Branch.

THE attention of the local vinegrower should be particularly directed to the two following points: first, the great rapidity with which fermentation, if uncontrolled, takes place, causing an enormous increase in the temperature of the fermenting mass; second, the low contents of acids in the generality of Australian musts. These two conditions, unfortunately, very often occur together. It is just in those hot and dry seasons, when the must is likely to get overheated in the cellar, that, for the same climatic reasons, the quantity of acid in the must is reduced to a low figure. It is then, if no measures are taken, that the two factors act conjointly, and we have mannitic fermentation, unfortunately too well known to some vinegrowers under the name of lactic fermentation, which spoils many gallons of wine every year.

The low percentage of acids, beside, does not only act prejudicially during the period of fermentation, but has a more lasting effect, because it produces wines with a deficiency of fixed acids, and consequently very liable to alterations, such as "la casse," &c., and very soon getting flat and overmatured.

The correction of the must, that is the raising of the acidity, is, fortunately, a comparatively easy matter if the vinegrower knows the acidity of his must, and to this end the offer of this Department to make free analyses of grape juice at vintage time should be availed of more largely by the vignerons of this State.

The question of cooling the must is by far the most serious, and it is essentially a matter of expense. It should be noted that the lower the temperature at which fermentation takes place, the better the results of the fermentation. The matter of cooling the must, and particularly of cooling the wine, is one that has not received the attention it deserves in Australia.

For the purpose of cooling the must there are different kinds of apparatus, and their cost is between £60 and £70 delivered, Sydney. These refrigerators have already been adopted in several cellars of the State, and their use is gradually extending. The way these refrigerators work is very simple, the only thing required being a constant supply of water. It is often the case that when the weather is hot and dry and there is every probability that the must will get very hot, that there is at the same time a great scarcity of water, or the supply at disposal has such a high temperature that the cooling is rendered very defective.

For these reasons, during the last few years the employment of sulphurous acid has been suggested by the Viticultural Expert, Mr. Blunno, for the

purpose of delaying the course of fermentation, so as to give the must time to cool down. This system has been adopted in many cellars in Europe and in Australia with good results, and its application tends to increase every day. The use of sulphurous acid, of course, is not a new thing in the practice of vinification and in the wine industry; the difference consists in the purpose for which the sulphurous acid is applied.

In this respect it may be useful to make some observations in connection with some articles which have appeared, especially in recent times, in different periodicals relating to viticulture, in which it is stated, among other things, that the use of sulphurous acid cannot be considered as a substitute for temperature control; in other words, that "sulphiting cannot replace cooling." As statements of this kind might induce many small vinegrowers of this State to abstain from using this process, it may be convenient to state that European experience does not apply, except in a very few cases, to New South Wales conditions. If it is a fact, as reported,* that "sulphiting of the must tends to become general in France, and one can, without much risk, foresee the day when there will not be a single litre of ordinary wine made in France which has not been sulphited," this can be explained by the fact that the object of the French vignerons in adding sulphurous acid is not to cool the must (of which there is no need in France, or at least none as compared with New South Wales), but either to take advantage of the selective action of the acid on ferment organisms, whereby a true alcoholic fermentation is obtained, or to prepare the must for the employment of special yeast cultures, or, and more often, to utilise the preservative action of the acid.

The only place where conditions can be rightly compared with Australia is Algeria. The practice, which is extending in that country, consists in completely stopping the fermentation by addition of heavy doses of sulphurous acid, which permits of storing away the must or grapes so treated till conditions of temperature are favourable to a proper fermentation. Special apparatus is then used for the removal of sulphurous acid by a partial vacuum and raising the temperature of the must to about 155 degrees. The inconvenience of the new method is the danger of partial caramelisation of the sugar and the resulting presence of abnormal flavour in the wine. The question of cost has also to be considered, and all things taken into account, it is doubtful whether it would not be better to instal a small refrigerating plant, the cost of which would not be prohibitive, especially when there is already a motor on the farm, or in the case of co-operative vineries.

But this does not answer the question for the small vinegrower, who cannot afford to buy an expensive plant, and who could also ill afford to buy a large number of extra casks, besides having to wait for the money returns for his wine.

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* Ventre in *Progrès Agricole*, 18th August, 1912, reported by Mr. De Castella in the Journal of the Department of Agriculture, Victoria, 10th February, 1913.

It was owing to these considerations that the following experiments were carried out, and their objects were principally as follow :—

First.—To find out the best rules to follow, or in other words, at what stage, at what intervals, and in what quantity sulphurous acid is required to prevent the temperature of the must rising above the critical point.

Second.—To ascertain the effects of the addition of tartaric acid in various proportions to the must prior to fermentation.

Third.—To ascertain the effects of the treatment with sulphurous acid conjointly with the addition of tartaric acid.

Details of the Experiments.—First Series.

Through the courtesy of Messrs. James Angus and Sons, proprietors of Minchinbury Vineyard, Rooty Hill, the experiments were carried out on a large scale in their cellars, with both white and red musts.

In the first series of experiments, the quantity of must treated was 70 gallons for each test, altogether 350 gallons being employed. In the second series the quantity of must was 280 gallons in each vat, 560 gallons of wine altogether being under examination.

White Must from Pinot Blanc (White Pinot) Grapes.—The European stock had been grafted on Rupestris du Lot, on which it appears to do well. The vines are five years old.

The soil is a clayish loam. The season was very dry, only about 3 inches of rain being recorded in the previous seven months.

The grapes were crushed, stemmed, and the juice immediately pressed, only plain juice being employed.

Five casks, each of about 120 gallons capacity, were filled with 70 gallons of the juice drawn from the bulk. These casks were marked 1 to 5, and their contents were subjected to the following treatments :—

Cask No. 1.—Left untouched, as control and check.

Cask No. 2.—Tartaric acid was added at the rate of 0·4 per thousand.

Cask No. 3.—Metabisulphite of potassium was added at the rate of 8 oz. per 200 gallons. This salt was used as the most convenient way of supplying a definite amount of sulphurous acid. The crystals were ground and made into a fine powder, which readily dissolved in about a pint of cold water. Successive additions of four equal doses of potassium metabisulphite were made to the must every six hours or thereabout. It may be noted in passing that it would seem that some people find considerable difficulty in dissolving potassium metabisulphite in water. This salt is very readily soluble in water if sufficient time is given to the crystals to dissolve. Reduction to a fine powder, of course, facilitates its solution, which takes place in a few minutes and completely. Cold water should be used to avoid loss of sulphurous acid. Three pints of water should be sufficient for 16 oz. of potassium metabisulphite.

Cask No. 4.—Tartaric acid was added at the rate of 0·4 per thousand, as in cask No. 2, and potassium metabisulphite at the same rate as in cask No. 3, and at the same intervals.

Cask No. 5.—Tartaric acid was added at the rate of 1·6 per thousand.

After twenty hours, as the must of cask No. 2 seemed to show little difference, if any, from the control cask, it was thought advisable to change the plan of experiment by adding a full dose, that is, 8 oz. per 200 gallons, of potassium metabisulphite to this cask at one time.

Progress of the Operations.

The exact time at which the successive doses of potassium metabisulphite were added to cask Nos. 3 and 4 is indicated in the annexed Table I, where the readers will find all the particulars of the progress of the fermentation.

The combined Diagrams will give a graphic idea of the rate of consumption of sugar in the five casks, and of the changes in their temperatures, as well of the influence of the different additions of sulphurous acid.

Effects of Potassium Metabisulphite.—The alteration in the *modus operandi* in cask No. 2 proved most successful. Whether too long time was allowed to elapse between the additions of small doses to casks Nos. 3 and 4, or not, the fact is that the addition of the full amount of sulphurous acid to cask No. 2 was followed by the best results. As may be seen from Table I, the fermentation was almost stopped, and when it started again it proceeded at a very slow rate. While in the twenty following hours the content of sugar in the control cask diminished by 9 per cent., in cask No. 2 only 1 per cent. was transformed into alcohol and carbonic acid. At the end of another twelve hours fermentation in cask Nos. 1, 3, 4, and 5 was practically complete, but the must of cask No. 2 still contained approximately 8·25 per cent. of sugar. The temperature of the control cask and of No. 5 reached 100 degrees; in cask No. 2 it never went over 92 degrees, and in all probability, if the addition of the full dose of sulphurous acid had been made a few hours before, the temperature could have been kept under 90 degrees.

The addition of small doses of potassium metabisulphite had only a slight retarding effect on the activity of the yeast; most probably, if these additions had been made more frequently the results would have been more striking; at any rate, it is evident that the effects which are obtained under such conditions are not comparable with those obtained by the early addition of the full dose of sulphurous acid.

Action of Tartaric Acid.—Though the full effect of the addition of this acid to the must cannot be seen yet, as it is on the wine that its influence is of importance, still, in regard to its action on the phenomenon of fermentation, it can be said that in the present cases tartaric acid had no delaying influence on the process of fermentation itself, contrary to what was found

in experiments on a small scale, as detailed in the *Agricultural Gazette* of February, 1913, page 147. The acid seemed to have acted in the sense of stimulating, rather than delaying, the work of the yeast. In small proportions, as in cask No. 2 at the beginning, and in No. 4, it evidently accelerated the process of fermentation, in the latter case counterbalancing partially the effect of sulphurous acid.

When used in larger proportion, as in cask No. 5, the fermentation proceeded practically in the same way as in the control cask.

It will be noted that in all casks, control inclusive, where the temperature reached 100 degrees, the must fermented completely, the quantity of sugar left being insignificant, as is shown also by the analysis. Though it is not possible yet to express an opinion as to the quality of the wines so produced, still the fact that at such high temperature the yeast could act on sugar, and bring about its total transformation (a fact which appears in an even more striking way in the second series of these experiments), would tend to show that the conditions of fermentation in this country are somewhat different from what is generally believed, and there is evidently need for further investigations.

The yield of alcohol in all the five casks is practically the same, and particularly good. It corresponds to a yield of 10 per cent. alcohol in volume from less than 16·5 per cent. of sugar.

Details of the Experiments—Second Series.

Must from Red Grapes of the Aspar Variety.—These vines are also grafted on Rupestris du Lot, on which they do well. The vines are four years old. The soil is the same, and climatic conditions were the same as in the preceding series.

The grapes were crushed, stemmed, and skins and juice fermented together.

The temperature at the time of picking was particularly high, so that the grapes when brought to the cellars were sensibly hot.

Owing to the difficulty of procuring many small casks, the experiments were only made in connection with the use of sulphurous acid for controlling the must temperature. The quantity of must in each vat was greater than in the preceding tests, there being approximately 280–300 gallons of liquid in each of the two vats; one, No. 1, where the addition of sulphurous acid was made, and No. 2, which was kept as control.

The annexed tables give all the details of the experiment. The conditions of temperature during the test were exceedingly unfavourable; on the 18th February the temperature rose to 104 degrees in the shade, and to 96 degrees in the fermenting room. On the same day the barometric pressure was very low, viz., 29·6—all conditions unfavourable to a regular fermenting process.

It was necessary in the course of the experiment to have recourse to the cooling apparatus, as the must of the control cask had reached the temperature of 108 degrees, and if left untouched it would have reached in all probability a still higher temperature, with grave danger of spoiling the wine.

This cooling down by mechanical means was not necessary with the must treated with sulphurous acid, and though this must reached an undue limit of 102 degrees, and kept for a long time at a temperature of 100 degrees, still the fermentation was complete, all sugar was decomposed, and up to the present no ill effects are foreshadowed from this cause.

The yield of alcohol in these tests is a little lower than in the preceding ones, which was to be expected, owing to loss by evaporation due to the high temperature; still it corresponds to a yield of 10 per cent. of alcohol by volume from 17 per cent. of sugar—a yield which is considered normal in the generality of cases.

Conclusions.

It is not possible yet, as has been said before, to draw definite conclusions from these experiments until the wines produced have reached a certain stage of maturity, when a preliminary tasting will have to take place, followed by chemical analysis, for a proper comparison of the qualities of each sample.

One thing, however, appears at this stage to be satisfactorily demonstrated, and that is that in using sulphurous acid for the purpose of checking the rapidity with which fermentation tends to take place, very good results can be obtained by adding an amount of 7 to 8 oz. of potassium metabisulphite per 200 gallons of must at the moment at which, fermentation having already started, there is a tendency to an excessive rise in temperature. The temperature of the must at the beginning should be a guide for the vine-grower; the higher the initial temperature the sooner the metabisulphite should be added to the must.

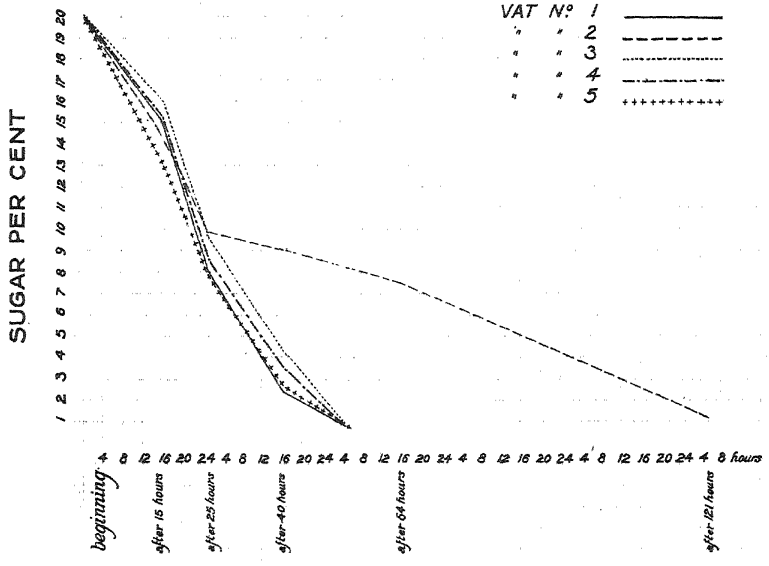
It is to be noted that the musts experimented with are typical samples of rather light musts, such as are produced in the coastal and cooler districts. The process of fermentation would take longer in the dry districts of the State, where the musts are usually denser and far richer in sugar. Experiments of the same nature with musts of other districts will be carried out as opportunity offers.

I may add that as a result of these experiments, on the advice of Mr. Büring, during this vintage, several wine-makers of the Hunter River district have used metabisulphite of potassium to moderate the progress of fermentation of their musts, and in all cases with satisfactory results.

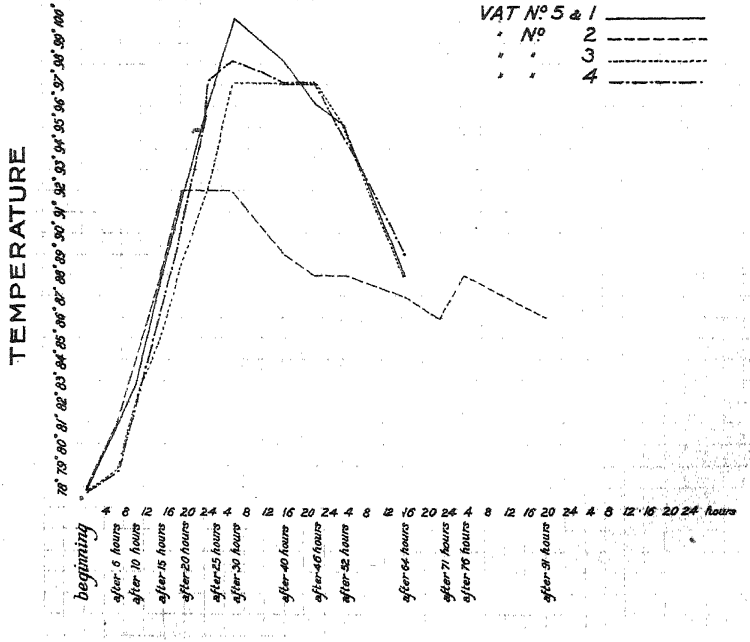
I have to tender my thanks to Mr. Leo Büring, manager of Minchinbury Vineyard, who took the greatest interest in these experiments, and was of valuable assistance to me in carrying them out. I am indebted to him for his attention and his useful collaboration in this work.

FIRST SERIES.
Diagrams showing the progress of the Fermentation.

I. CONSUMPTION OF SUGAR.

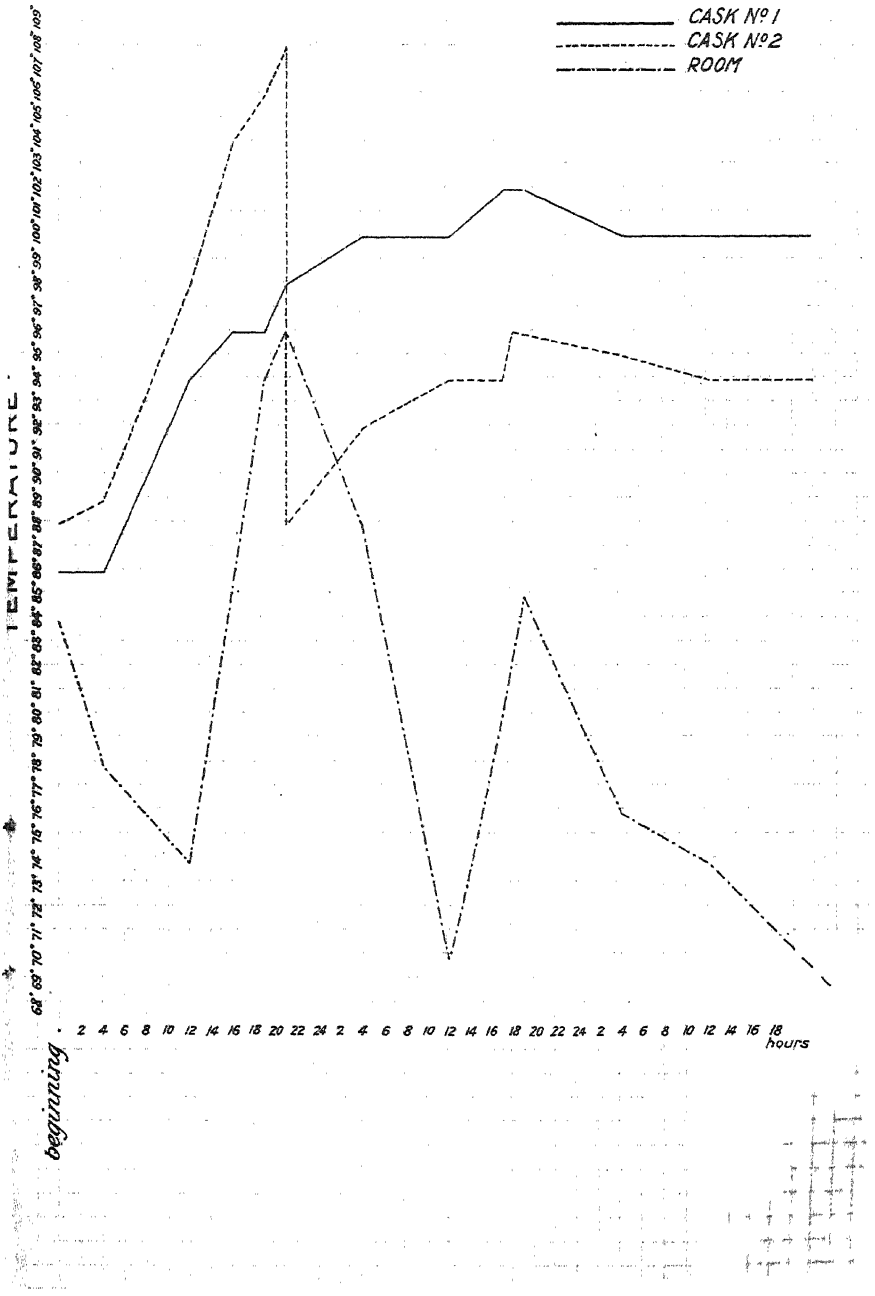


II. TEMPERATURE DURING FERMENTATION.



SECOND SERIES.

Diagram showing the Temperature of Cask N 1 and N 2 and of the room during the process of Fermentation.



SECOND SERIES.

Diagram showing the rate of Decomposition of Sugar in the two casks.

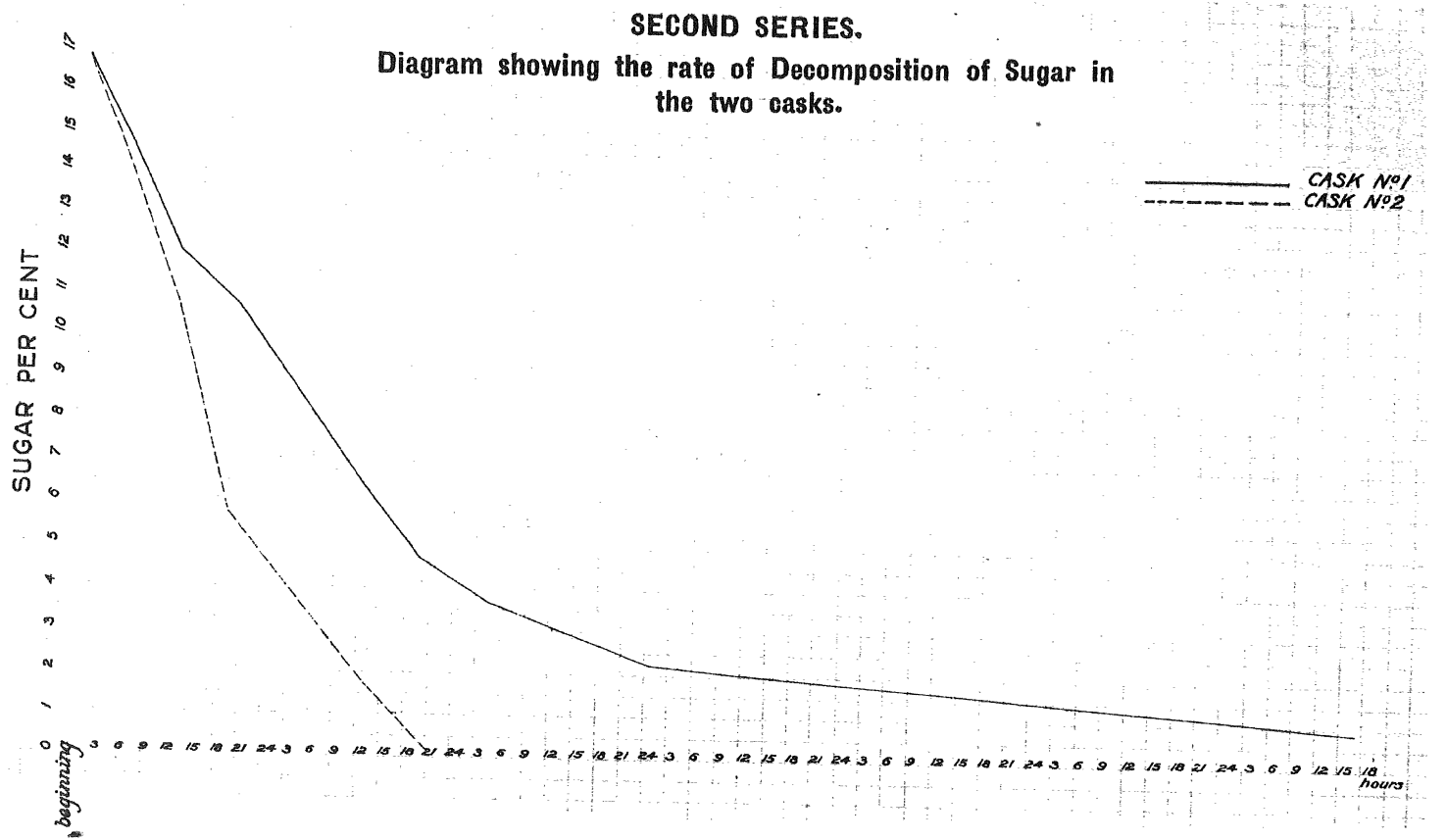


TABLE I.—FIRST SERIES.

Vat No.	Date, Time, &c.	Temperature of the Room.	Temperature of the Must.	Sugar.	Acidity.	Keene's Hydrometer.	Salleron's Musimetre.	Remarks.
				%	%			
1	31st Jan., 2 p.m.	83	78	..	7·6	..	..	Must in vats 2, 3, 4, 5, treated as explained.
2				after treatment.				
3				..	7·7	..	..	
4				20·05	7·7	21	1085	
5				..	7·7	..	..	
				..	9·0	..	..	
1	8 p.m.	78	81	..	..	..	..	
2			81	..	..	..	..	
3			79	..	..	..	..	
4			79	..	..	..	..	
5			81	..	..	..	..	
1	1st Feb., 12·45 a.m.	68	83	..	..	..	..	Full fermentation; No. 2 fermenting most strongly.
2			84	..	..	..	..	
3			82	..	..	..	..	
4			82	..	..	..	..	
5			83	..	..	..	..	
1	5·15 a.m.	64	88	15·2	8·8	..	..	Violent fermentation subsided a little; No. 2 frothed over slightly about 4 o'clock. Added second dose of metabisulphite to Nos. 3 and 4 at 5·30 p.m.
2			88	14·75	8·4	..	..	
3			85	16·16	8·5	..	..	
			86	15·43	8·7	..	..	
5			88	13·55	8·6	..	..	
1	10 a.m.	76	92	..	..	..	..	All fermenting vigorously. Added third dose to No. 4 and full dose to No. 2.
2			92	..	..	..	..	
3			89	..	..	..	..	
4			90	..	..	..	..	
5			92·5	..	..	..	..	
1	3 p.m.	85	96	7·83	..	..	..	
2			92	9·80	..	..	..	
3			93	9·54	..	..	..	
4			93	8·50	..	..	..	
5			97	7·77	..	..	..	
1	8 p.m.	83	100	..	..	..	..	Added third dose metabisulphite to No. 3 and last dose to No. 4.
2			92	..	..	..	..	
3			97	..	.	..	..	
4			98	..	..	..	..	
5			100	..	..	..	..	

TABLE I.—FIRST SERIES—*continued.*

Vat No.	Date, Time, &c.	Temperature of the Room.	Temperature of the Must.	Sugar.	Acidity.	Alcohol.	Keene's Hydrometer.	Salleron's Mustimetre.	Remarks.
		°	°	%	%	%	%		
1			98	2·34	5·3	..	..	1003	
2	2nd Feb.,		89	9·01	7·7	..	10	1038	
3	6·15	70-	97	4·32	8·7	..	3	1011	Added 4th dose metabisulphite to No. 3.
4	a.m.		97	3·53	8·5	..	2	1008	
5			98	2·64	8·8	..	1	1005	
1			96	..	..	..	..	..	
2			88	..	..	..	..	..	
3	12 a.m.	88-	97	..	..	..	..	..	
4			97	..	..	..	..	..	
5			97	..	..	..	..	..	
1			95	..	..	..	..	..	
2			88	..	..	..	..	..	Fermentation practically completed. No. 2 fermenting briskly; no foam on surface.
3	6 p.m.	80-	95	..	..	..	..	..	
4			94·5	..	..	..	..	..	
5			94	..	..	..	..	..	
1			88	..	..	..	..	..	
2	3rd		87	7·46	7·9	..	..	..	
3	Feb.,	68-	88	..	..	..	..	..	
4	6 a.m.		89	..	..	..	..	..	
5			87	..	..	..	..	..	
2	1 p.m.	..	86	..	..	..	..	..	Fermenting vigorously, with froth.
2	6 p.m.	88	86	..	..	..	..	..	
2	4th Feb., 9 a.m.	76	86	..	..	..	..	..	
	Samples taken 5th February, prior to racking.						Volatile Acids.		
1	..	..	..	0·20	6·9	12·13	0·3	..	
2	..	..	..	1·00	6·8	11·52	0·5	..	Fermenting.
3	..	..	..	0·24	6·8	12·05	0·4	..	
4	..	..	..	0·60	7·1	11·87	0·4	..	
5	..	..	..	0·26	7·5	12·13	0·48	..	
	5th Feb.			Racked.					

TABLE II.—SECOND SERIES.

Vat.	Temperature of the Room.	Date, Time, &c.	Temperature of the Vat.	Sugar.	Acidity.	Keene's Hydrometer.	Salleron's Mustimetre.	
	°	Feb.	°	%	%	%	%	
1	84	17th,	86	16·71	5·2	16½	1070	Grapes hot when picked.
2	88	6 p.m.	88	16·71	5·9	16½	....	
1	78	10 p.m.	86	....	....	....	....	
2			89	....	....	....	....	
1	74	18th,	94	11·94	6·0	....	....	Metabisulphite added to No. 1—15 oz. to 280 gallons of must.
2		6 a.m.	98	10·67	6·2	....	....	
1	86	10 a.m.	96	....	....	....	....	
2			104	....	....	....	....	
1	94	1 p.m.	96	10·67	6·2	11	1045	
2			106	5·70	6·8	5	1020	
1	96	3 p.m.	98	....	....	....	....	
2			108	....	....	....	....	Cooled down artificially to 88 degrees.
1	88	10 p.m.	100	....	....	....	....	Fermenting strongly.
2			92	....	....	....	....	
1	70	19th,	100	6·25	6·3	5	1020	
2		6 a.m.	94	1·70	6·1	0	1000	
1	80	11 a.m.	102	....	....		....	
2			94	....	....			
1	85	1 p.m.	102	4·60	6·4			
2			96	0·40	5·9			
1	76	10 p.m.	100	3·57	6·			
2			95	....	....			
1	74	20th,	100	....	....			
2		6 a.m.	94	....	....			
1	76	6 p.m.	100	2·12	6·5			
2			94	....	....			
1	68	21st,	100	....	....	....	*	
2		6 a.m.	94	Nil.	4·5	9·86	0·056	Racked two hours after.
1	..	24th, 9 a.m.	....	0·80	6·7	9·04	0·036	

Alcohol absolute. Volatile acidity as acetic.

16·95 per cent. sugar = 10 per cent. alcohol.

* Sample of No. 1 received in the laboratory on 22nd February. It was fermenting; kept bottled till 24th, when it was sterilised and tested.

A COMPLEX FUNGUS.—*Macrosporium persicinum* (McAlp.).

THE Bureau of Microbiology, reporting on cherry twigs affected with the above fungus, remarked that it is a complex fungus, as it is associated with three other forms, all of which may be only stages in the development of one fungus. It attacks the twigs, especially the fruit buds, producing gumming, and finally kills the twigs. As a result the fruit-bud may be shed, so that treatment should be commenced early. At the present time all gumming and dying twigs should be cut out and burned, and where the crop has been destroyed pruning could be done, and the tree cleansed. All the gumming, however, may not be due to fungus only. Young cherry trees are easily "scalded" and gum may be produced by pruning, but with summer pruning there will be less likelihood of gum production, and every prospect of cleansing the trees, while with winter spraying continued into the spring before the buds begin to swell and burst the fungus should be well checked.

Departmental Fruit Exhibit.

Royal Agricultural Show, 1913.

W. J. ALLEN.

The Department annually goes to considerable trouble in collecting and staging an exhibit at the Royal Agricultural Show, which represents, in a small way, the results of the work it is carrying on in the orchards situated in various parts of the State. As the accompanying illustration proves, the exhibit at the 1913 Show was a particularly complete one, and it was presented under much more favourable conditions than in the past, with the result that it was inspected by a large number of visitors.

The exhibit included fifty cases of apples, graded and packed for export in the most approved style, and many apple-growers spent a profitable half hour inspecting these cases. About one hundred named varieties were displayed, most of which were grown at Bathurst, but Wagga, Yanco, and Dural Experiment Orchards were also represented. Several boxes and cartons contained evaporated apples, the product of Bathurst Experiment Orchard.

About seventy different varieties of pears from Bathurst, Wagga, and Yanco Orchards were staged, and about one hundred cases of assorted dried peaches, apricots, nectarines, quinces, raisins, sultanas, currants, prunes, plums, and candied fruits, most of which were processed at the Hawkesbury Agricultural College, Yanco, and Wagga Orchards. The cured fruits had all been treated by the most up-to-date methods, and the quality of many of the exhibits indicated to orchardists the possibilities that are opening up for a profitable industry. Australian cured prunes easily bring from 2d. to 3d. a lb. more than the imported article, and it has been found that they are cured better than the Californian fruit, and will keep in our moist climate without loss, while Californian prunes often arrive mouldy or become so after being kept for a short time. There was a fine collection of bottled fruits, most of which were processed at the Hawkesbury College, but all of our older orchards were represented in this class. The olive oil came from Wagga, where the olive does well. Fresh peaches, most of which had been kept in cold storage for periods varying from two to six weeks, suggested the best varieties for canning, drying, and dessert purposes. A display of nuts was made up of several varieties of almonds, two of walnuts, and the Queensland nut (*Macadamia ternifolia*).

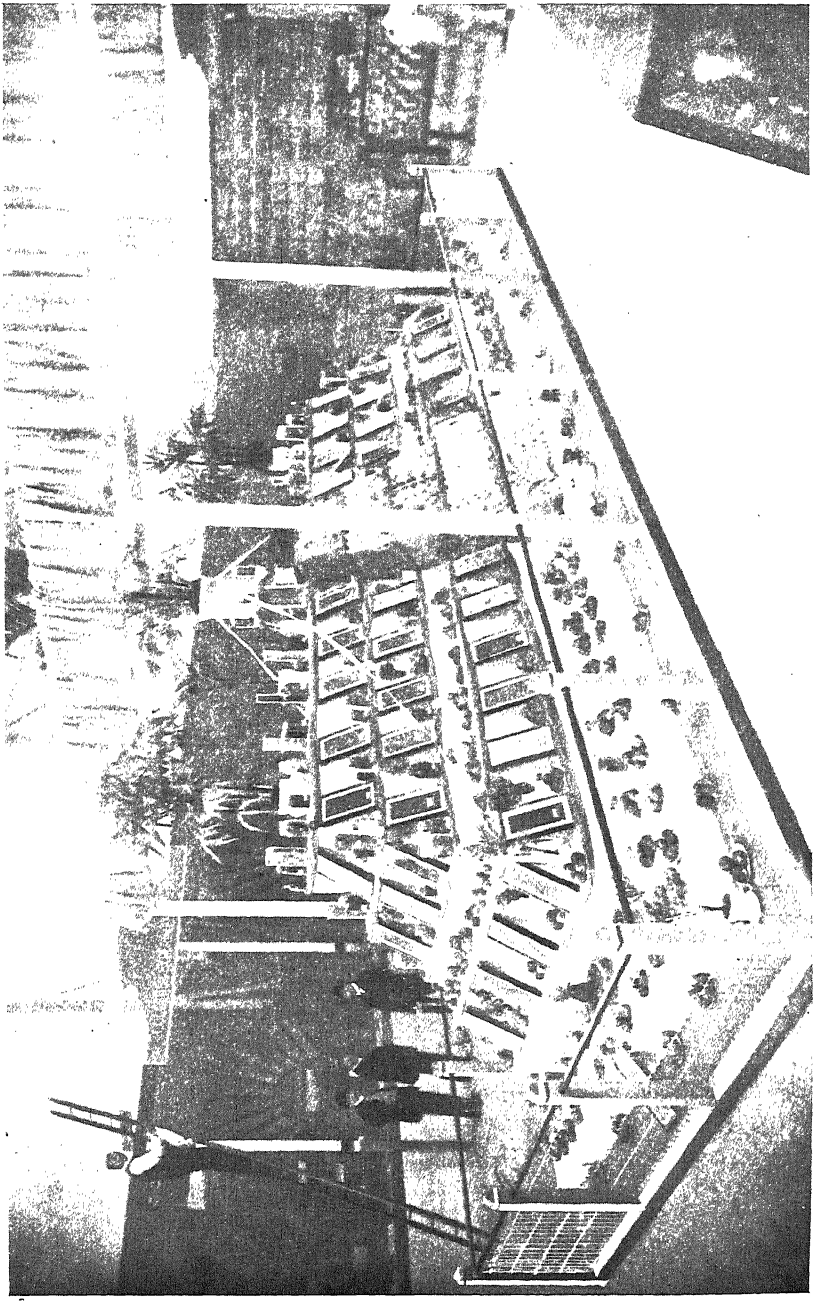


Exhibit of Fruit from the Department's Orchards at Sydney Royal Show, 1913.

Egg-laying Competitions at the Hawkesbury Agricultural College.

Eleven Years' Work.

D. S. THOMPSON, Poultry Expert.

The eleventh year's work in connection with the egg-laying competitions organised by the *Daily Telegraph* terminated on 1st April last.

In several respects fresh successes were achieved, and the general results bear out the value of this experimental work and its stimulating influence on commercial poultry-keeping. The data of previous years have been confirmed and amplified, and among other results authoritative data of the fourth year's laying of ducks are now for the first time available to the poultry world. The new feature introduced for this series by the committee of management was a test of judgment in selection. Breeders were invited to enter duplicate pens of the same strain and breeding, selected as good and bad layers respectively. In a couple of instances conspicuous success was achieved, and eight out of ten breeders were able to pick pens of "good" layers that gave better financial results than their counter pens of "bad" layers. The whole sixty "good" hens returned a net profit of 1s. 9d. each more than the sixty "bad" hens, which to the poultry farmer would be a material consideration. The committee's hope is that by focussing attention upon the art of selection poultry farmers may find it a means of enhancing their profits by culling their wasters.

The general laying of the hens has been rather below that of the previous year, and the higher prices obtained for eggs was counterbalanced by the increased cost of feed. The ducks, on the other hand, laid very much better than previously, the dry summer being especially conducive to this. The average value of their eggs, too, was greater, and this more than balanced the higher cost of feed. Still, the hens returned nearly double the average profit shown by the ducks.

The conspicuous feature is the establishment of a new world's record for first-year laying. The previous record for six birds was 1,589 eggs by a pen of White Leghorns at the Roseworthy Agricultural College (South Australia) competition in 1911–12. This has been eclipsed by Mr. F. Morison's pen of Indian Runner ducks, which put out 1,601 eggs, notwithstanding that the first egg was not laid until April 12. As the eggs averaged 31 oz. per dozen, the six ducks laid no less than 258 lb. weight of eggs. The net market value

of the eggs was £8 11s. 2d. The following is the daily record of the laying of this pen :—

April : 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 4 1 2 3 4 6 6 6 6 6	...	53
May : 6 4 5 3 5 4 5 4 3 6 6 6 5 6 6 6 4 3 4 4 3 4 4 6 5 6 4 6 4 6 6	...	149
June : 6 6 6 6 6 6 5 5 6 6 5 5 6 6 5 5 5 5 5 5 6 6 5 5 6 6 6 6 6 6 4	...	167
July : 4 2 4 3 2 3 5 4 4 3 3 6 6 6 6 6 6 6 5 4 6 6 5 6 4 6 6 6 4 6 6	...	149
August : 3 4 4 3 5 4 6 5 4 4 5 6 5 6 4 6 6 6 5 6 5 6 5 5 4 4 4 5 5 5 5 5		150
September : 5 4 3 5 5 4 5 5 6 4 4 5 5 5 6 5 6 6 4 6 5 6 6 6 6 6 6 6 5	...	156
October : 3 5 6 3 6 6 5 6 5 5 5 5 4 5 4 4 5 6 4 5 3 6 6 4 5 5 5 4 3 4 6	...	148
November : 4 5 6 5 4 5 6 5 4 5 2 6 5 5 5 5 6 5 4 5 4 4 3 6 4 5 5 6 5 6	...	145
December : 6 6 6 6 6 5 5 6 6 5 5 6 6 6 5 5 5 4 3 2 4 5 5 4 6 4 5 5 5 4 4 6	...	156
January : 4 4 6 6 6 5 4 5 5 4 4 5 4 4 4 4 4 6 4 4 6 4 4 2 3 4 3 3 4 5 5	...	135
February ; 5 5 5 4 3 4 4 3 2 4 4 4 4 6 4 3 5 3 4 2 3 3 2 5 2 3 2 2	...	100
March : 2 2 2 3 1 4 3 4 3 3 3 3 5 3 3 3 3 3 2 4 3 5 2 3 3 2 4 2 4 3 3	...	93

As these birds did not commence to lay till 12th April, 1912, they were kept at the College till 11th April, 1913, to complete the full twelve months. The laying for this period was as follows :—

2 2 4 2 3 3 2 3 3 3 3

making a grand total of 1,631 eggs.

The executive management was in the hands of a committee consisting of Messrs. H. W. Potts (Principal of the Hawkesbury College), D. S. Thompson, F. J. Brierley, S. Ellis, W. T. Ely, L. L. Ramsay, E. Waldron, and A. A. Dunnicliff, junior (*Daily Telegraph*).

THE PRIZE WINNERS.

Liberal cash prizes were given, amounting to £123 5s., and including £50 donated by the *Daily Telegraph*. The following were the winners in the various sections :—



Typical hen in Hillcrest Farm's Third Year pen.

Third-year Hens.

Greatest number of eggs in the third twelve months :—Hillcrest Farm (1), £3 ; R. Jobling (2), £2 ; E. Greentree (3), £1.

Monthly prize of 10s. for the highest total from a pen :—April, R. Jobling, 54 eggs ; May, R. Jobling, 78 ; June, R. Jobling, 57 ; July, R. Jobling, 77 ; August, E. Greentree, 102 ; September, C. C. Kennett, 132 ; October, C. C. Kennett, 120 ; November, C. C. Kennett, 115 ; December, Hillcrest Farm, 124 ; January, Hillcrest Farm, 114 ; February, Hillcrest Farm, 89 ; March, Hillcrest Farm, 66.

Gold Medal for the pen laying most eggs in the third year, without the replacement of a bird in the three years :—R. Jobling.

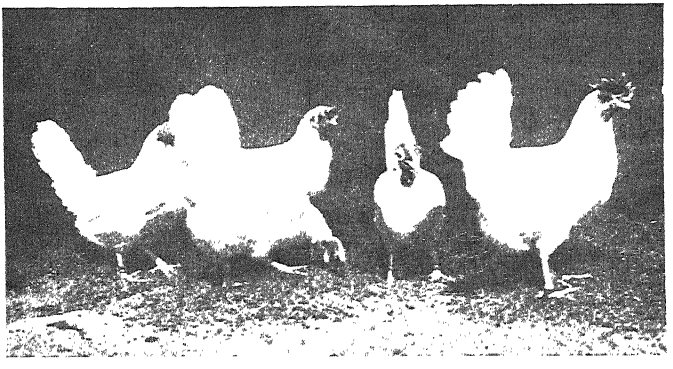
Second-year Hens.

Greatest number of eggs in second twelve months :—R. Boardman, (1), £3 ; Mrs. E. Scaysbrook (2), £2 ; G. White (3), £1 10s. ; M. A. White (4), £1 ; N. Kaiser (5), 10s.

Greatest number of eggs in the two years :—R. Boardman (1), £2 10s. ; Cowan Bros. (2), £1 10s. ; N. Kaiser (3), £1.



Mr. S. Champion's White Leghorns. Winners of Eleventh Annual Competition.



Hillcrest Poultry Farm, White Leghorns. Winners of Third Year Test.



Mr. R. Jobling's Silver Wyandottes. Gold Medal winners in Third Year Test.

Winter test (April to July, inclusive):—Mrs. E. Scaysbrook, 252 eggs (1), £2; R. H. Stewart, 215 (2), £1; R. Boardman, 196 (3), 10s

Market value of eggs for two years:—R. Boardman (1), £2; Cowan Bros. (2), £1 10s.; G. White (3), £1.

Monthly prize of 10s. for the highest total from a pen:—April, R. Boardman and R. H. Stewart, 74 eggs each, divided; May, Mrs. E. Scaysbrook, 69; June, R. H. Stewart, 58; July, M. A. Vennard, 90; August, Cowan Bros., 120; September, M. A. White, 135; October, Miss A. Vaughan, 141; November, N. Kaiser, 139; December, R. Boardman, 125; January, M. A. White, 126; February, N. Kaiser, 89; March, A. Hollings, 74.

Special trophy, value £5, for the pen laying the most eggs in the two years without the replacement of a bird:—N. Kaiser.

Eleventh Annual Competition.

Greatest number of eggs in the twelve months:—S. Champion (1), £5; H. J. F. Peters (2), £4; W. J. Ransley (3), £3; C. Bloomfield (4), £2; A. Ringk (5), £1 10s.; Hillcrest Farm (6), £1; H. Hammill (7), £1; A. W. Waine (8), £1.

Winter test, (April to July inclusive):—A. W. Waine, 430 eggs (1), £3; S. Champion, 390 (2), £2; C. Bloomfield, 381 (3), £1 10s.; Mrs. L. B. Gresson, 377 (4), £1.

Market value of eggs for the twelve months:—S. Champion (1), £2 10s.; H. J. F. Peters (2), £1 10s.; W. J. Ransley (3), £1.

General utility prizes (open to pens the hens in which averaged at least 6 lb. each in weight on March 1, 1913), decided by the number of eggs laid:—A. W. Waine, total weight of hens 37 lb. (1), £2 10s.; W. Smith, 36 lb. (2), £1 10s.; D. Kenway, 39 lb. (3), 10s.

Monthly prize of 10s. for the greatest number of eggs from a pen:—April, A. W. Waine, 80 eggs; May, Mrs. L. B. Gresson, 130; June, S. Champion, 137; July, Mrs. J. H. Jobling, 143; August, W. J. Ransley, 144; September, Hillcrest Farm, 154; October, S. Champion, 156; November, H. Hammill, 147; December, W. J. Ransley, 149; January, S. Champion, 143; February, S. Champion, 109; March, W. J. Ransley, 103.

Test of Judgment in Selection.

Greatest difference in the number of eggs laid by the two pens in the twelve months (subject to the pen selected as bad layers producing the smaller total):—Mrs. L. B. Gresson, 236 points (1), £2 10s.; O'Hearn Bros., 232 (2), £1 10s.; W. Smith, 120 (3), £1.

Fourth-year Ducks.

Greatest number of eggs in the fourth twelve months, trophy value £3 3s.:—G. E. O. Craft.

Third-year Ducks.

Greatest number of eggs in the third twelve months:—Mrs. B. Wakfer (1), trophy value £3 3s., or cash; G. E. O. Craft (2), £1 10s.; G. Plowman (3), 10s.

Monthly prize of 5s. for the highest total from a pen (fourth-year ducks also eligible):—April, G. E. O. Craft, 80 eggs; May, Mrs. B. Wakfer, 79; June, D. Salter, 70; July, Mrs. B. Wakfer, 85; August, Mrs. B. Wakfer, 96; September, G. E. O. Craft, 108; October, Bright and Thompson, 145; November, G. E. O. Craft, 123; December, Mrs. B. Wakfer, 118; January, Mrs. B. Wakfer, 96; February, Mrs. B. Wakfer, 68; March, Bright and Thompson, 34.

Second-year Ducks.

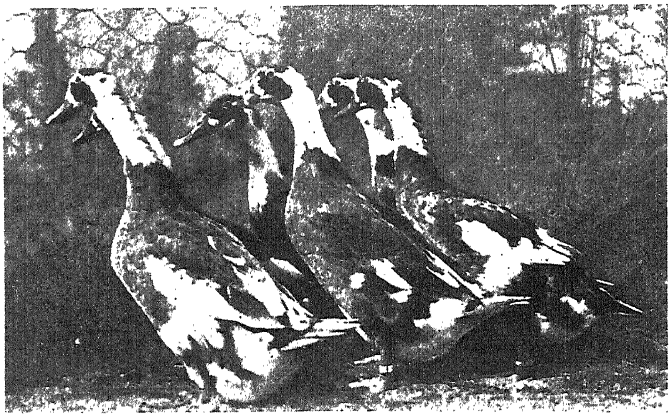
Greatest number of eggs in the second twelve months:—J. A. Friend (1), £2 10s.; J. P. de Beyer (2), £1 10s.; D. Little (3), £1.

Fourth Annual Duck Competition.

Greatest number of eggs in the twelve months:—F. Morison (1), £4; D. Little (2), £2 10s.; G. E. O. Craft (3), £1 10s.; St. Joseph's Farm (4), 10s.

Market value of eggs for twelve months:—F. Morison (1), £1 10s.; D. Little (2), £1; St. Joseph's Farm (3), 10s.

Monthly prize of 5s. for the highest total from a pen (second-year ducks also eligible):—April, D. Little, 115 eggs; May, F. Morison, 148; June, F. Morison, 167; July, F. Morison, 149; August, G. E. O. Craft, 151; September, F Morison, 156; October, D. Little, 166; November, St. Joseph's Farm, 170; December, F. Morison, 156; January, F. Morison, 135; February, F. Morison, 100; March, F. Morison, 93.



Mr. J. P. de Beyer's Indian Runners. Winners of Two-years' Test.

GENERAL REVIEW.

With the eleventh annual test a new series was commenced, and no one can prophesy what the last of the second ten-years' series will bring forth. Certainly there has been a big advance in the general average per hen from the 131 to 184 in the first decade, and if the general average of the whole State has risen in unison this must mean a very greatly enhanced profit for those connected with the industry. The test year just concluded has been a very trying one for the poultry-farmer, but the troubles that come are often great teachers of economy, and doubtless the lessons taught by these tests, coupled with the high rates for feed, have compelled many to look for more productive hens than they have possessed in the past.

The Weather.

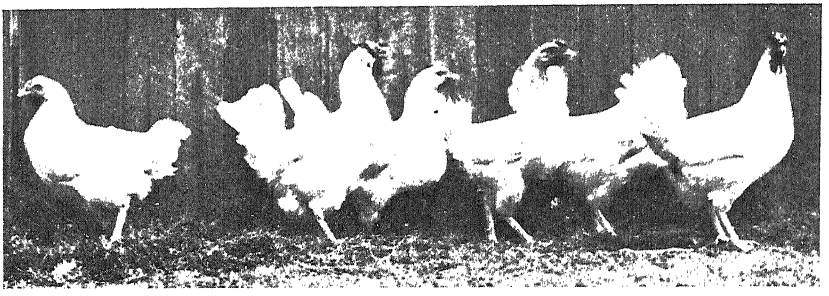
The weather conditions experienced throughout the year have been variable enough; but taken as a whole, the seasons have been favourable to egg production. April opened fine, with a little rain towards the close, and the egg yield was maintained at about the same level as last year, which topped all previous scores. May was also fine as a whole, and the previous year's output was equalled. June was a very mild month, and few frosts were experienced; but, notwithstanding the genial weather, the average came out at the very low total of 74 eggs per hen for the pullets, as compared with 87 for the previous year. This shortage of no fewer than 13 eggs, which the birds were never able to make up, proved a stumbling-block to any advance in the general average for the test. July was very wet, and, while the pullets made a great rally, they were handicapped by the unpropitious weather.

Right on from July to the end of the competition year dry weather conditions prevailed, perhaps one of the driest seasons on record for this particular time and locality. This parched up the grass, and showed the necessity for supplying green fodder. If there is anything more than another which these tests have demonstrated it is the absolute necessity of furnishing green feed, and the best for this purpose is undoubtedly lucerne.

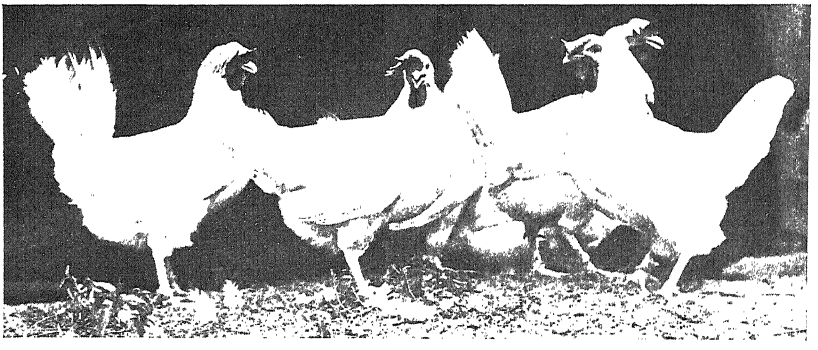
Although the weather from July to March was very dry, there were no excessively hot days. On several days in January the glass rose to 104 degrees and 106 degrees, but these are comparatively slight when compared with the 112 degrees and 117 degrees of 1905 and 1906, when we had a very large death roll from heat apoplexy. This year there were practically no heat-wave deaths—only the normal losses from ovarian causes.

The System of Feeding.

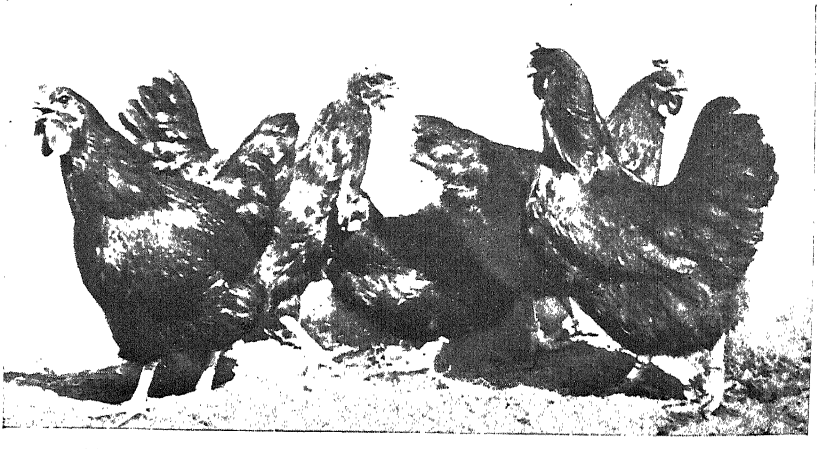
The hens have been fed on the simplest diet possible throughout the competition. The morning mash, fed at 7 a.m., consists of one-quarter bran to three-quarters pollard. A mixture of one-third bran to two-thirds pollard is generally recommended, and this is the best mixture when no green stuff is fed, but where this can be supplied liberally it will be found that one of bran to three of pollard will produce the most eggs. The bran



Mr. R. Boardman's Rose Comb White Leghorns. Winners of Two-years' Test.



Mrs. L. B. Gresson's "Best" pen in "Test of Judgment in Selection."



Mr. W. Smith's Black Orpingtons. Winners of Second Prize for General Utility.

is scalded with liver soup twice a week, and dried down with the pollard. On the other days the bran is scalded in winter, but cold water only is used in summer. We quite admit that the scalding of the bran, as has been decided by Mr. Guthrie, Chemist to the Department of Agriculture, is of considerable benefit, but in practice it is not worth while to scald in hot weather, and time and fuel can thus be saved. In the winter the poultryman is glad to kindle a fire, and in addition to the benefit of scalding the bran for greater digestibility there is the advantage of being able to serve up the food in a warm condition on a cold morning.

The quantity of food given is governed by no rule-of-thumb measurement, as the hens are all fed to repletion, but an imperial pint to six hens will be found a good guide for the amateur, and this will be found very near the average quantity required thoughout the year. In the forenoon (about 10 a.m.) the hens are supplied with finely-chaffed green lucerne, and it will be found that the six hens will require about a pint of this.

Between 4 and 5 p.m. grain is fed, crushed maize being preferred for winter, and wheat for summer, with a change to wheat in the winter, and an occasional change to crushed maize in the summer, the latter more particularly when a cold, wet snap sets in. Again, an imperial pint will be found a good indicator of quantity, but the hens should have more if they will eat it.

Cut-up liver used to be fed at a different time of the day, and by itself in the earlier competitions, but it has been found that by mincing the liver into a fine meal it can be easily mixed with the morning mash, and it adds a zest which the hens are not slow to appreciate.

The Broody Propensity.

The general broodiness has been much less than previous years, and the broodiness in the Mediterranean breeds has been reduced 50 per cent. in the number of pens. Last year no fewer than twenty hens went broody in fourteen pens, and only eight hens this year in seven pens, only the one pen giving more than one broody.

The Test of Judgment in Selection.

This question has been much ventilated during the last few years. Ever since the advent of the various systems I have had doubts of the efficiency of a formation test, and, with maturer experience, am quite satisfied that while the basis of formative testing is scientifically correct, it is an intuition which cannot be imparted from one man to another. Different breeds require different methods of testing, and so do the various strains. While a man may be proficient in picking out his best and worst layers in his own breed and strain, he might be quite at sea when attempting to do the same thing in regard to another yard, where a totally different breed or a different strain is kept.

The present test shows that most of those competing are on the right lines in selecting the best layers, and perhaps the experience given to them and to the others will be of value to themselves, even if it is only to enlighten them that they cannot always successfully achieve their object. The following is a comparison of the results :—

—	"Good" Layers.		"Bad" Layers.		Points.
	Eggs.	Value.	Eggs.	Value.	
		£ s. d.		£ s. d.	
Mrs L. B. Gresson	1,047	6 1 2	811	3 19 6	236
O'Hearn Bros.	1,000	5 10 3	768	4 1 7	232
W. Smith	1,203	6 10 5	1,083	5 15 5	120
W. T. Ely	910	4 8 1	870	4 4 5	40
D. Kenway...	1,120	6 6 2	1,081	5 13 5	39
J. Woods	827	4 11 0	799	4 6 1	28
C. C. Kennett	1,104	6 2 9	1,090	5 17 2	14
F. J. Brierley	1,065	5 13 7	1,095	5 6 3	— 30
J. J. McKenna, jun.	904	4 15 3	983	4 19 9	— 79
R. J. Stuart	903	4 17 2	1,025	5 6 9	—122

The Ducks.

For the final, the whole of the duck sections have quite excelled themselves by very large increases. The first-year ducks have put up the splendid average of over 202 eggs per duck, and the champion pen, by exceeding 1,600, has proved what many experts believed—that the India Runner is the greatest egg-laying machine extant.

In the second and third years the ducks' averages have also greatly increased, and, while showing that the capacity for egg production is more sustained in the second and third years in ducks than in hens, the profits diminish almost to zero for the third year. Ducks cannot favorably compare with hens as money makers, and the primary reason is that they consume more food, and the food bill is very much more costly.

Mortality and Disease.

The health of the birds has been uniformly good, and there has been no case of infectious disease. The death-rate has decreased considerably during the last few years. As already stated, the whole of the deaths were due to certain troubles. There were 30 deaths among the 360 pullets, or 8 per cent.; 12 among the 180 second-year hens, or 6 per cent.; and eight deaths among the 60 third-year hens, or 13 per cent. The mortality among the ducks was even much lighter, only eight deaths taking place among the 150, or just over 5 per cent.

THE FINANCIAL ASPECT.

The 600 hens of various ages showed a net average profit over the cost of feed of 9s. 10¼d. each, while the corresponding return from the 150 ducks was 5s. 1d. each. The total net value of the hen eggs, after deducting freight and commission charges, was £500 1s. 3d., and the cost of feed £216 8s., leaving a surplus of £283 13s. 3d. The total net value of the duck eggs was £126 19s. 3d., and the cost of feed £88 15s. 6d., leaving a balance of £38 3s. 9d. The total profit shown was £21 4s. 6d. less than in the previous year. The following are the details :—

Third-year Hens.

Cost of feeding.—Grain, £12 5s ; bran and pollard, £6 10s.; shell grit, 10s.; meat, £1 1s.; green feed, 15s. Total, £21 1s., or 7s. 0¼d. per head.
Market value of eggs laid, £33 8s. 10d., leaving a profit of £12 7s. 10d.

Second-year Hens.

Cost of feeding.—Grain, £37 2s. 6d.; bran and pollard, £20 2s. 6d.; green feed, £2; meat, £31 1s.; shell grit, £2. Total, £64 6s., or 7s. 1¾d. per head.
Market value of eggs laid, £126 14s. 1d., leaving a profit of £62 8s. 1d.

First-year Hens.

Cost of feeding.—Grain, £74 10s.; bran and pollard, £41 10s.; meat, £6 6s ; shell grit, £4 5s.; green feed, £4 10s. Total, £131 1s, or 7s. 3½d. per head.
Market value of eggs laid, £339 18s. 4d. (including £47 10s. 4d. by 10 pens of "bad" layers), leaving a profit of £208 17s. 4d.

Fourth-year Ducks.

Cost of feeding.—Bran and pollard, £9 17s. 6d.; meat meal, £1 6s.; shell grit, 15s. 6d.; green feed, 8s. Total, £12 7s., or 10s. 3½d. per head.
Market value of eggs, £12 19s. 8d., leaving a profit of 12s 8d., or 6½d. each.

Third-year Ducks.

Cost of feeding.—Bran and pollard, £13 15s.; meat meal, £1 12s. 6d.; shell grit, £1 ; green feed, 10s. Total, £16 17s. 6d., or 11s. 3d. per head.
Market value of eggs laid, £20 13s. 10d., leaving a profit of £3 16s. 4d.

Second-year Ducks.

Cost of feeding.—Bran and pollard, £18 6s.; meat meal, £1 15s.; shell grit, £1 5s.; green feed, 10s. Total, £21 16s., or 12s. 1½d. per head.
Market value of eggs laid, £31 3s. 4d., leaving a profit of £9 7s. 4d.

First-year Ducks.

Cost of feeding.—Bran and pollard, £30 10s.; meat meal, £3 5s.; shell grit, £3 ; green feed, £1. Total, £37 15s., or 12s. 7d. per head.
Market value of eggs laid, £62 3s., leaving a profit of £24 8s.

COMPARISON OF RESULTS.

The following compares the results of the whole series :—

THIRD-YEAR HENS.

	First Competition.	Second Competition.	Third Competition.
Number of pens	10	10	10
Highest total, three years	3,063	3,293	3,282
,, ,, third year	823	1,013	910
,, ,, second year	1,008	1,045	1,110
,, ,, first year	1,333	1,341	1,321
Average per hen, first year	207·9	206·8	183·2
,, ,, second year	156·2	148·7	146·9
,, ,, third year	115·3	130·1	109·2
Profit over feed per hen, first year	14/3½	18/6½	11/8½
,, ,, ,, second year	11/-	6/8¾	8/6
,, ,, ,, third year	4/9	5/8	4/5
Greatest value of eggs, three years	£16/9/3	£16/18/8	£16/19/7

	Eggs per Hen.			Value per Hen.		
	First Year.	Second Year.	Third Year.	First Year.	Second Year.	Third Year.
30 White Leghorns	203	162	123	20/6	12/5	12/7
12 Silver Wyandottes	180	147	92	18/-	16/2	10/2
12 Black Orpingtons	165	123	99	15/4	11/-	9/10
6 White Orpingtons	127	112	94	12/5	11/4	11/3
Average cost of feed per head	.....	.....	.....	6/5½	5/11	7/0¼

SECOND-YEAR HENS.

	First.	Second.	Third.	Fourth.	Fifth.	Sixth.
Number of pens	40	50	40	40	30	30
Highest total, two years	2,487	2,634	2,319	2,369	2,372	2,373
,, ,, second year	1,054	1,150	1,013	1,045	1,110	1,028
Average per hen, first year	180	179	190	194	184	201
,, ,, second year ...	124	127	140	134	140	135
Profit over feed per hen, first year	11/2	10/11	11/4	16/9	10/2	14/4
,, ,, ,, second year	6/0½	5/4¾	9/8	5/8	8/3	6/11
Greatest value of eggs, two years ...	12/1/6	12/16/9	13/2/5	12/14/2	12/2/2	12/11/7

	Eggs per Hen.		Value per Hen.	
	First Year.	Second Year.	First Year.	Second Year.
6 Rose-comb White Leghorns ...	224·1	171·3	23/4	18/7
114 S.C. White Leghorns	205·9	141·3	20/1	14/4
42 Black Orpingtons	191·4	123·8	19/3	13/3
12 Plymouth Rocks	184·0	121·0	19/3	13/4
6 Silver Wyandottes	188·5	112·0	18/11	11/4

Test of Judgment in Selection.

	"Good" Layers.	"Bad" Layers.
Number of pens	10	10
Total eggs laid	10,083	9,605
Average per hen	168	160
Total value	£54/15/10	£49/10/4
Value per hen	18/3	16/6
Cost of feed per hen	7/3½	7/3½
Profit over feed per hen ...	10/11½	9/2½

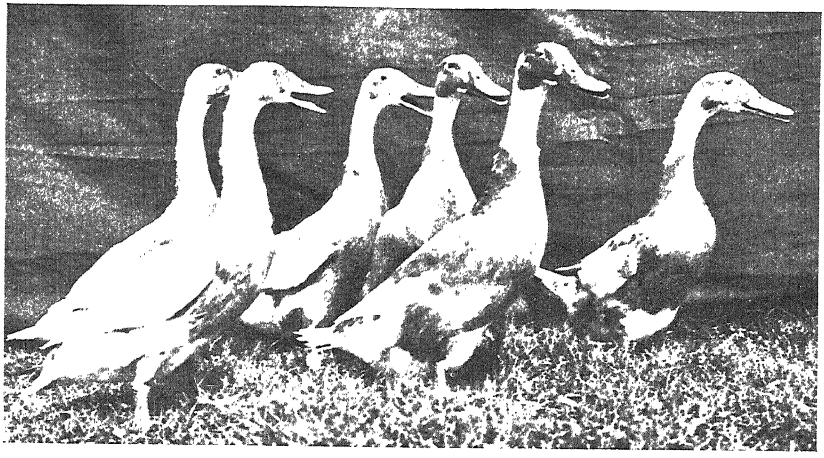
Eleventh Annual Competition.

	No. of Pens.	Winning Total.	Lowest Total.	Highest Monthly Total.	Average per Hen.	Greatest Value.	Average Price of Eggs.	Average Value per Hen.	Cost of Feed per Hen.	Profit over Feed.
1st ...	38	1,113	459	137	130	140/-	1/1	15/6	6/-	9/6
2nd ...	70	1,308	666	160	163	150/-	1/3¾	17/9	5/9¾	12/-
3rd ..	100	1,224	532	154	152	114/-	1 -	12/9	4/5½	8/3
4th ...	100	1,411	635	168	166	125/-	1/1½	13/3	5/3½	8/-
5th ...	100	1,481	721	162	171	137/-	1/0½	14/10	5/10	9/-
6th ...	60	1,474	665	161	173	149/-	1/2¼	17/2	7/-	10/2
7th ...	50	1,379	656	159	180	146/-	1/3¼	19/2	7/9½	11/4
8th ...	60	1,394	739	158	181	173/-	1/5¼	21/9	6/9	15/-
9th ...	40	1,321	658	151	168	134/5	1/2	16/3½	6/5½	10/2
10th ...	50	1,389	687	146	184	141/9	1/2½	18/5½	6/1½	12/4
11th ...	50	1,461	603	156	178	164/7	1/3½	19/4¼	7/3½	12/0¾

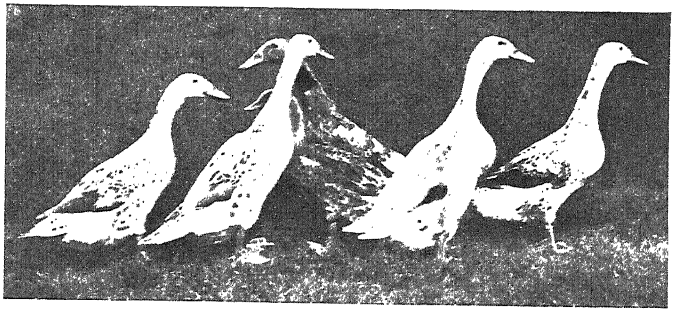
	Eggs per Hen.	Value per Hen.
168 White Leghorns	189·9	20/6¼
24 Brown Leghorns	186·8	19/10½
42 Black Orpingtons	175·3	19/1¾
18 Langshans	171·5	18/11
24 Silver Wyandottes	152·3	17/-
6 Minorcas	145·0	14/4½
6 Black Leghorns	141·0	14/6¾
6 Buff Orpingtons	125·6	14/11½
6 Red Surreys...	100·5	11/1

Fourth-Year Ducks.

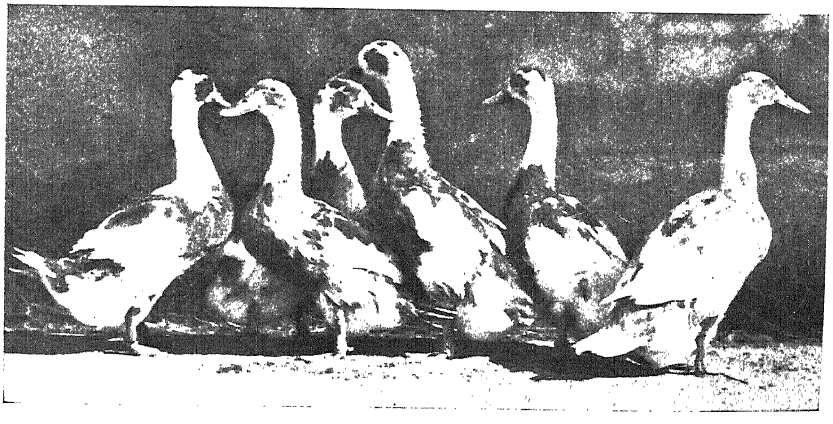
	Eggs per Duck.				Value per Duck.			
	First Year.	Second Year.	Third Year.	Fourth Year.	First Year.	Second Year.	Third Year.	Fourth Year.
18 Indian Runners ...	186	185	121	109	19/8	12/8	10/8	11/1
6 Buff Orpingtons ...	184	147	117	104	19/10	16/7	9/9	9/11



Mr. F. Morison's Indian Runner Ducks. Winners of Fourth Annual Duck Competition with World's Record score of 1,601 eggs.



Mrs. B. Walker's Cantonese Ducks. Winners of Three-years' Test.



Mr. G. E. O. Craft's Indian Runner Ducks. Winners of Fourth-year Test.

THIRD-YEAR DUCKS.

	First Competition.	Second Competition.
Number of pens	4	5
Highest total, three years ...	3,183	3,001
Highest total, third year ...	826	986
Highest total, second year ...	1,244	985
Highest total, first year ...	1,220	1,158
Average per duck, first year ...	183	184
,, ,, second year	176	138
,, ,, third year ...	120	135
Profit over feed, per duck, first year.	10/3	6/4½
,, ,, second year	6/5	4/2½
,, ,, third year	/2¾	2/3½

	Eggs per Duck.			Value per Duck.		
	First Year.	Second Year.	Third Year.	First Year.	Second Year.	Third Year.
6 Cantonese	171	164	164	17/8½	10/8	17/-
24 Indian Runners	187	176	128	14/4½	13/10½	13/-

SECOND-YEAR DUCKS.

	First Competition.	Second Competition.	Third Competition.
Number of pens	5	6	6
Highest total	2,464	2,015	2,367
Highest second year	1,244	985	1,132
Average per duck, first year ...	185·3	185	194
Average second year	175·6	136	176
Profit over feed, per duck, first year.	10/7½	6/3	7/9
Profit second year	5/9½	-/11½	5/2

FIRST-YEAR DUCKS.

	First Competition.	Second Competition.	Third Competition.	Fourth Competition.
Number of pens	25	20	15	10
Winning total	1,235	1,278	1,245	1,601
Lowest total	507	835	714	921
Highest monthly total	177	166	180	170
Average eggs per duck	156·5	170·5	173	202·7
Greatest value	134/5	113/7	111/6	171/2
Average price of eggs	1/3	1/0½	1/1	1/2¾
Average value per duck	16/6	14/10½	15/7½	20/9
Cost of feed per duck	9/6	10/-	10/-	12/7
Profit over feed, per duck ...	7/-	4/10½	5/7½	8/2

THE DETAILED RETURNS.

The following tables give full details of the number of eggs laid by each pen of six birds, together with the market value and the average weight of the eggs. The figures in parentheses after each competitor's name indicate the number of birds replaced owing to deaths over the whole period of the section. In the eleventh annual competition, the pens with an asterisk (*) preceding the owners' name were selected as bad layers.

THIRD-YEAR HENS.

Owner and Breed.	First Year.	Second Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	Jan.	Feb.	March.	Third Year.	2nd total.	Weight per doz.	Value Third Year.	Total Value.
																	oz.		
1. *Hillcrest* Poultry Farm (2), Berowra: White Leghorns.	1262	1110	42	23	20	37	88	90	103	114	124	114	89	66	910	3282	26	97/5	339/7
2. R. Jobling (0), Wallsend: Silver Wyandottes	1090	962	54	78	57	77	69	101	91	82	73	73	48	46	849	2901	25	96/8	309/4
3. E. Greentree (1), Wyong: White Leghorns ..	1111	970	5	7	22	24	102	102	102	94	97	90	78	55	783	2864	2	78/8	276/-
4. C. C. Kennett (1), Glenfield: White Leghorns	1128	1006	2	29	24	33	88	132	120	115	87	74	48	15	767	2901	26	74/9	288/6
5. H. Hammill (0), Kogarah: White Leghorns ..	1321	950	13	6	24	67	100	109	109	53	73	59	43	24	680	2051	26	67/7	295/-
6. E. Waldron (0), Willoughby: Black Orpingtons	950	685	27	—	—	—	21	92	118	86	86	89	64	43	623	2261	26	63/2	212/4
7. W. Smith (3), Rydalmere: Black Orpingtons..	1030	799	2	—	—	13	66	83	84	82	82	80	44	30	572	2401	26	55/8	221/8
8. Mrs. E. L. Scott (3), Willoughby: White Orpingtons.	705	676	34	17	20	22	34	86	87	68	44	62	48	45	567	2008	26	69/2	211/8
9. F. J. Brierley (3), Cheltenham: White Leghorns.	1268	845	—	20	3	11	50	68	78	61	65	86	63	45	550	2663	26	60/6	270/-
10. A. C. Rule (1), Croydon: Silver Wyandottes..	1071	811	30	2	3	5	23	46	60	33	18	19	14	3	256	2138	26	25/3	221/9

SECOND-YEAR HENS.

Owner and Breed.	First Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Second Year.	Grand Total.	Weight per doz.	Value Second Year.	Total Value.
																oz.		
1. R. Boardman (1), Camden: R.C. White Leghorns ..	1345	74	52	20	50	79	123	138	125	125	107	63	72	1028	2373	25	111/5	251/7
2. Cowan Bros. (1), Burwood: White Leghorns.. ..	1389	21	48	50	68	120	127	119	102	80	72	54	43	904	2293	26	94/9	236/6
3. N. Kaiser (0), Sackville: White Leghorns	1330	10	14	19	85	110	127	124	139	93	93	89	54	957	2287	26	97/-	234/9
4. G. White (1), Willoughby: White Leghorns	1265	29	37	27	62	116	125	121	112	117	114	81	55	996	2261	26	104/5	236/5
5. Range Farm (0), Toowoomba (Q.): White Leghorns	1359	3	—	13	64	106	128	133	116	103	99	61	48	874	2230	26	85/9	225/5
6. M. A. Vennard (1), Eastwood: White Leghorns ..	1272	11	—	21	90	115	111	126	113	117	101	87	52	944	2216	25	95/8	226/8
7. Mrs. E. Scaysbrook (1), East Gosford: Bk. Orpingtons	1178	64	69	45	74	107	104	116	100	84	104	78	68	1013	2191	26	113 5	227/-
8. M. A. White (1), Wilberforce: White Leghorns ..	1190	41	11	16	35	115	135	139	124	124	126	71	58	995	2185	27	101/3	231/4
9. S. Ellis (1), Botany: White Leghorns	1292	35	6	20	77	107	118	115	98	105	86	48	23	838	2130	26	84 4	218 5
10. Miss A. Vaughan (0), Ballina: White Leghorns ..	1216	—	—	44	34	98	132	141	125	113	122	61	1	871	2087	25	81/4	205 1
11. Miss L. Griffin (0), Kenthurst: White Leghorns ..	1167	16	19	18	56	84	118	124	124	106	115	53	46	879	2046	25	87/2	206/5
12. W. E. Boutcher (1), Canterbury: White Leghorns ..	1225	22	11	43	36	78	121	122	99	86	91	77	28	814	2039	25	82 8	203/2
13. Mrs. E. J. Hunt (0), Berowra: White Leghorns ..	1173	41	21	12	35	83	111	116	97	111	110	62	45	844	2017	26	87 8	201/8
14. T. Partridge (2), Westmead: White Leghorns ..	1262	29	10	—	39	74	112	118	79	92	88	71	38	750	2012	26	76/-	207/9
15. A. Duffield (1), Carlingford: White Leghorns ..	1217	23	10	19	42	93	91	102	92	83	103	84	46	788	2005	26	82/9	202/-
16. Johns Bros. (1), Wyong: White Leghorns	1551	8	14	39	60	91	111	124	107	111	114	60	13	852	2003	25	85 4	198/1
17. S. C. Jones (2), Wentworthville: White Leghorns ..	1286	23	29	24	16	75	98	107	78	87	82	47	36	702	1988	26	71/9	205/-
18. Turner Bros. (0), Ingleburn: White Leghorns ..	1176	64	46	23	22	95	101	101	80	88	86	64	37	810	1986	27	87/8	206/-
19. Griffiths Bros. (0), Balgowlah: White Leghorns ..	1157	19	—	6	41	107	116	120	114	94	106	77	24	824	1981	25	80/6	183 9
20. Mrs. J. Fitzgibbon (0), Marrickville: White Leghorns	1196	16	22	11	38	95	114	106	79	84	108	63	45	781	1977	26	80/9	199 2
21. C. Leach (1), Belmore: Plymouth Rocks	1139	36	20	19	35	94	99	97	93	74	74	69	73	783	1922	26	83/2	204/5
22. H. J. Hollier (0), Emu Plains: Black Orpingtons ..	1149	25	18	19	55	108	99	92	99	68	72	53	61	769	1918	25	80/-	199/-
23. J. Morgan (2), Port Kembla: Black Orpingtons ..	1137	40	21	13	76	84	106	97	86	75	79	47	50	777	1914	26	82/4	193/4
24. A. Hollings (0), Eastwood: Black Orpingtons ..	1196	28	17	46	40	57	79	104	68	56	81	17	74	667	1863	26	72 4	198/-
25. T. Brophy (0), Upper Manilla: White Leghorns .	1167	17	9	20	24	88	102	103	80	82	82	62	21	690	1857	26	68/9	186/5
26. W. H. Forsyth (0), Willoughby: Silver Wyandottes	1131	21	20	8	34	83	115	103	64	88	67	24	45	672	1803	25	68/-	181/5
27. W. J. Poole (2), North Ryde: Black Orpingtons ..	1185	40	37	14	32	70	95	92	38	50	63	48	34	613	1798	24	66/-	185/2
28. A. K. Kennedy (0), Carlingford: Black Orpingtons	1129	45	25	20	43	61	109	85	76	42	70	36	45	656	1785	26	69 9	180/9
29. C. W. Brown (1), Jilliby Jilliby: Black Orpingtons..	1066	21	17	12	72	103	80	82	82	66	89	61	31	716	1782	26	74/5	183/7
30. R. H. Stewart (0), Berowra: Plymouth Rocks ..	1070	74	54	58	29	71	77	63	59	50	53	47	35	670	1740	24	77/9	188 4

ELEVENTH ANNUAL COMPETITION.

Owner and Breed.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Total.	Weight per doz.	Market Value.
														oz.	
1. S. Champion (0), Eskbank: White Leghorns	45	100	127	118	131	145	156	142	147	143	109	98	1461	24	164/7
2. H. J. F. Peters (0), Pennant Hills: White Leghorns	43	115	102	90	142	152	154	139	133	137	89	85	1381	24	153/-
3. W. J. Ransley (0), Llandilo: Brown Leghorns	49	77	102	116	144	125	138	138	149	122	105	103	1368	24	151/2
4. C. Bloomfield (0), Willoughby: White Leghorns	75	115	92	99	112	131	154	121	133	116	91	48	1287	24	145/7
5. A. Ringk (0), Ryde: White Leghorns	55	126	78	95	125	139	150	133	115	101	96	60	1273	24½	143/-
6. Hillcrest Farm (1), Berowra: White Leghorns	73	36	58	121	133	154	154	126	110	112	90	87	1254	25	139/-
7. H. Hammill (0), Kogarah: White Leghorns	—	88	96	93	130	135	146	147	134	133	93	54	1254	24	132/-
8. A. W. Waine (0), Wollongong: Black Orpingtons	80	113	95	142	116	117	133	88	104	105	68	71	1232	24½	143/3
9. F. W. Rose (0), Bankstown: White Leghorns	16	71	92	114	117	130	140	137	87	138	105	78	1225	24¼	134/5
10. Gordon Bros. (0), Hoxton Park: White Leghorns	13	87	101	101	122	135	139	117	128	114	91	59	1207	25½	132/4
11. W. Smith (2), Rydalmere: Black Orpingtons	—	67	116	99	126	141	134	128	111	119	99	63	1203	24	130/5
* W. Smith (1), Rydalmere: Black Orpingtons	—	38	102	115	116	137	134	115	102	92	59	73	1083	24	115/5
12. J. Heavey (1), Penrith: White Leghorns	36	82	58	88	122	137	141	132	125	124	84	55	1184	25	128/8
13. R. Farlow (0), Freeman's Reach: White Leghorns	39	105	75	104	119	136	144	112	114	105	79	46	1178	26½	130/3
14. E. H. Shipp (0), Helensburgh: White Leghorns	—	68	80	114	123	135	136	134	107	122	94	63	1176	25	124/6
15. W. Thiele (0), Kenthurst: White Leghorns	47	88	76	85	126	146	111	111	123	108	64	64	1149	24½	127/4
16. J. Waugh (0), Bankstown: White Leghorns	27	35	74	68	109	132	147	125	138	123	95	69	1142	25½	121/6
17. W. G. Smith (0), Carlingford: White Leghorns	52	87	81	86	100	133	126	125	108	129	80	34	1141	25½	126/2
18. G. Hopping (1), Ingleburn: White Leghorns	35	79	57	74	124	129	147	128	126	113	80	47	1139	25	122/7
19. Miss A. Kable (2), Tamworth: White Leghorns	11	48	64	82	133	135	150	122	118	126	89	51	1129	25½	118/6
20. D. Kenway (2), W. Pennant Hills: Black Orpingtons	52	79	114	104	105	126	120	123	95	83	48	72	1120	24	126/2
* D. Kenway (0), W. Pennant Hills: Black Orpingtons	—	11	96	126	133	141	122	116	90	99	75	72	1081	25½	113/5
21. W. J. Tipper (0), Belmore: White Leghorns	36	53	48	94	111	129	134	127	121	121	85	60	1119	25½	120/3
22. H. Ekin (0), West Kogarah: Langshans	76	76	107	87	124	117	124	98	81	86	79	60	1115	25	126/7
23. Mrs. J. H. Jobling (0), Plattsburg: Black Orpingtons	5	33	99	143	140	115	138	118	105	91	51	67	1105	26½	117/9
24. C. C. Kennett (0), Glenfield: White Leghorns	31	84	87	111	115	115	123	106	110	89	80	53	1104	24½	122/9
* C. C. Kennett (1), Glenfield: White Leghorns	11	97	68	94	120	134	137	118	121	102	58	30	1090	25½	117/2
25. A. D. Knox (1), West Wallsend: Black Orpingtons	28	105	91	123	132	132	116	94	75	91	64	39	1090	24½	121/7
26. Mrs. S. R. Davis (0), Turramurra: White Leghorns	26	17	36	115	123	140	146	112	102	107	86	66	1076	24	112/-
27. R. Jobling (1), Wallsend: Silver Wyandottes	21	95	112	133	134	109	106	102	83	63	62	53	1073	25	123/-
28. G. H. McKittrick (0), South Grafton: White Leghorns	16	29	104	129	126	137	122	114	81	90	59	63	1070	25	114/5
29. F. J. Brierley, (0), Cheltenham: White Leghorns	25	36	52	109	139	128	119	97	111	102	83	64	1065	24	113/7
* F. J. Brierley (1), Cheltenham: White Leghorns	23	29	88	132	140	133	120	105	95	95	71	64	1095	23	106/3
30. C. Griggs (0), Arncliffe: Brown Leghorns	11	60	45	62	110	132	141	130	97	124	93	60	1065	23	112/5
31. Mrs. L. B. Gresson (1), Killara: White Leghorns	54	130	116	77	101	120	103	107	79	80	43	37	1047	24½	121/2
* Mrs. L. B. Gresson (0), Killara: White Leghorns	30	65	57	46	68	86	101	98	68	104	55	33	811	24½	79/6
32. Mrs. F. L. Healey (1), Wentworthville: White Leghorns	2	66	37	99	118	136	131	122	115	120	59	37	1042	28	108/8
33. R. S. Youl (0), Turramurra: Silver Wyandottes	70	73	82	103	114	94	103	100	81	84	69	63	1036	25½	118/6
34. Waratah Yards (1), Dulwich Hill: Brown Leghorns	10	65	65	99	103	135	141	113	95	107	47	52	1032	24	109/9
35. R. and F. Ray (1), Carlingford: Brown Leghorns	17	13	37	55	85	127	148	135	103	122	105	72	1019	25	103/6
36. W. Sessions (0), Scone: White Leghorns	11	47	68	60	109	126	136	127	89	124	66	50	1013	26	99/2

ELEVENTH ANNUAL COMPETITION—*continued.*

Owner and Breed.	April.	May.	June.	July.	August.	Sept.	October.	Nov	Dec.	January.	Feb.	March.	Total.	Weight per doz.	Market Value.
														oz.	
37. D. Quinlan (0), Spring Hill: White Leghorns	7	45	60	98	116	118	126	107	100	115	89	27	1008	24½	106/-
38. O'Hearn Bros. (0), West Maitland: Langshans	27	62	73	83	127	100	121	91	88	84	74	64	1000	26	110/3
* O'Hearn Bros. (0), West Maitland: Langshans	11	22	38	69	111	104	82	69	83	44	46	39	768	24	81/7
39. Morrison Bros. (0), Ryde: White Leghorns	4	72	33	49	96	123	123	116	121	125	80	26	978	23¾	103/-
40. F. Styles (1), Hill Top: Langshans	12	37	110	101	122	113	115	89	92	75	51	55	972	24½	105/-
41. W. T. Ely (0), Rydalmere: White Leghorns	14	37	58	45	105	137	139	105	108	94	50	18	901	24½	88/9
* W. T. Ely (0), Rydalmere: White Leghorns		25	62	65	117	125	123	116	92	82	48	15	870	25½	84/5
42. J. J. McKenna, jun., (1), Kenthurst: Black Orpingtons	4	30	71	81	120	103	99	89	95	96	60	57	904	24	95 3
* J. J. McKenna, jun., (0), Kenthurst: Black Orpingtons	7	46	83	90	121	132	107	111	64	104	54	64	983	24	99 9
43. R. J. Stuart (0), Blacktown: White Leghorns	10	19	57	84	94	96	108	100	92	93	91	59	903	24	97/2
* R. J. Stuart (1), Blacktown: White Leghorns		32	48	89	119	119	124	125	107	111	94	67	1025	22½	106/9
44. A. J. Wood (2), Sunny Ridge: Minorcas	20	26	13	39	111	115	135	124	108	99	60	20	870	24½	8 4
45. G. S. Spencer (0), Pennant Hills: Black Leghorns	25	54	53	38	89	118	127	105	81	103	47	6	846	27	87/9
46. J. Woods (1), Arncliffe: Silver Wyandottes	7	39	84	94	90	87	83	82	76	79	57	49	827	22	91 -
* J. Woods (0), Arncliffe: Silver Wyandottes	13	15	65	114	98	86	81	85	67	73	48	54	799	24	86 1
47. L. Ducat (0), Upper Bankstown: Buff Orpingtons	43	91	71	83	79	71	66	58	40	50	48	53	773	24	89.9
48. A. C. Rule (3), Croydon: Silver Wyandottes	5	15	50	46	98	73	94	76	75	63	65	59	719	24	76/-
49. L. L. Ramsay (1), Carlingford: Black Orpingtons		9	22	69	95	120	95	73	83	68	59	16	709	25	69.9
50. F. Connolly (0), Riverstone: Red Surreys	15	32	65	65	71	71	61	34	60	59	56	11	60	21½	66/6

FOURTH-YEAR DUCKS.

Owner and Breed.	First Year.	Second Year.	Third Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Fourth Year.	Grand Total.	Weight per doz.	Value Fourth Year.	Total Value.
																		oz.		
1. G. E. O. Craft (2), Ingleburn: Indian Runners	1034	1019	826	54	33	21	15	30	108	132	123	100	93	48	5	762	3641	34	7?/6	337/3
2. D. Salter (3), Wilberforce: Indian Runners	1092	1075	644	32	51	70	72	54	66	50	63	70	48	36	13	626	3437	34	66/6	341 7
3. Hughes Bros. (0), Teralba: Buff Orpingtons	1105	882	703	22	16	42	82	21	101	121	87	78	32	23	0	625	3315	34	59/8	313/5
4. G. Rogers (1), North Ryde: Indian Runners	1220	1244	719	42	55	33	76	34	68	78	64	62	40	34	2	588	3771	33	6?/-	364/9

Third-year Ducks.

Owner and Breed.	First Year.	Second Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Third Year.	Grand Total.	Weight per doz.	Value Third Year.	Total Value.
																	oz.		
1. Mrs. B Wakfer (0), Chatswood: Cantonese ..	1030	985	56	79	50	85	96	78	117	115	118	96	68	30	986	3001	28	102/-	271/6
2. G. E. O. Craft (0), Ingleburn: Indian Runners	1120	764	80	70	45	68	41	81	138	114	99	64	33	0	826	2710	34	83/9	250/9
3. G. Plowman (0), North Bondi: Indian Runners	1122	830	47	57	42	56	86	106	110	86	95	69	35	8	797	2749	32	80/-	255/9
4 Bright and Thompson (0), Dulwich Hill: Indian Runners	1090	771	38	37	45	41	14	96	145	117	104	75	50	34	786	2647	34	77/4	235/8
5. H. Short (2), Ryde: Indian Runners	1158	807	36	64	55	41	41	52	79	90	103	72	45	0	678	2613	32	70/9	246/9

Second-year Ducks.

Owner and Breed.	First Year.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Second Year.	Grand Total.	Weight per doz.	Value Second Year.	Total Value.
																oz.		
1. J. P. de Beyer (0), Charlestown: Indian Runners ..	1245	65	55	63	96	95	107	160	149	125	88	59	60	1122	2367	32	114/-	225/6
2. J. A. Friend (0), Willoughby: Indian Runners ..	1210	52	46	79	88	98	126	150	145	117	111	66	54	1132	2342	30	114/2	220/8
3. D. Little (2), North Ryde: Indian Runners .. .	1176	115	60	100	83	55	86	99	128	118	103	68	58	1073	2249	29	116/2	237/-
4. C. Kenny (0), Ryde: Indian Runners	1120	80	41	53	59	105	136	151	130	108	73	45	40	1021	2141	32	101/	208/8
5. G. Rogers (0), North Ryde: Indian Runners .. .	158	42	27	54	72	95	123	146	127	111	83	49	48	977	2135	31	76/-	179/3
6. G. E. O. Craft (0), Ingleburn: White Runners .. .	074	69	24	42	83	110	139	135	123	90	94	73	44	1026	2100	30	102/-	202/6

First-year Ducks.

Owner and Breed	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.	January.	Feb.	March.	Total.	Weight per doz.	Market Value.
														oz.	
1. F. Morison (0), Nowra: Indian Runners	53	149	167	149	150	156	148	145	156	135	100	93	1601	31	171/2
2. D. Little (0), North Ryde: Indian Runners	18	57	134	136	128	124	166	157	138	119	65	68	1310	30	133/3
3. G. E. O. Craft (0), Ingleburn: White Runners	7	80	144	131	151	148	147	134	119	104	69	49	1283	30	131/9
4. St. Joseph's Farm (0), Ryde: Indian Runners	44	61	110	145	127	113	153	170	135	84	63	77	1282	32	132/
5. Kapanui Yards (0), Auburn: Indian Runners	16	50	125	133	130	130	161	156	135	97	62	40	1234	31	125/5
6. G. Plowman (0), North Bondi: Indian Runners	—	46	132	116	144	139	137	143	135	87	73	86	1238	30	125/8
7. Morrison Bros. (0), Ryde: Indian Runners	—	76	143	143	117	96	137	150	128	74	64	58	1186	31	122/7
8. J. Knoetzch (0), Upper Bankstown: Indian Runners	47	84	101	128	116	131	145	133	87	84	32	1088	32	107/6
9. J. P. de Beyer (1), Charlestown: Indian Runners	41	58	49	100	84	91	139	146	115	68	66	66	1023	32	101/4
10. W. R. Williams (2), Boolaroo: Indian Runners	29	24	45	125	128	79	111	130	121	80	41	18	921	29	91/4

Spraying.

W. J. ALLEN.

THIS operation is now looked upon by all progressive fruit-growers as work which must of necessity be carried out, as they realise that a tree covered with scales and other pests can no more yield fruit which commands the attention of buyers than can an orchard where the cultivation, pruning and manuring are left to Nature's sweet will. There are still, however, a number of growers who have not realised the importance of this feature of the work, and a certain percentage of fruit is lost annually, much of which, by the timely application of a spray, could, no doubt, have been saved. It must be distinctly understood that in ninety-nine out of a hundred orchards spraying is absolutely essential. Diseases may not occur every year, but experience has shown that they recur frequently, and in years of serious epidemics the profits from spraying are so great, that the grower can afford to spray regularly as an insurance against loss. The following are four operations upon which all permanent success in fruit culture largely depend, viz., cultivation, manuring, pruning and spraying. Spraying is the last, but not the least important.

In the treatment of pests and diseases, the principal point is what remedy to use. Then comes the point of supplying it. The orchardist must identify the cause of his trouble, because, as a rule, insecticides are of no use against fungous diseases, and *vice versâ*. There can be no doubt whatever in the mind of up-to-date orchardists that the annual winter dressing of lime-sulphur, or Bordeaux mixture, is of very great benefit to the trees. Most growers know (for seeing is believing) the great loss caused by injurious insects and fungous diseases ; but only a few realise as yet that this loss is really a benefit to every up-to-date grower. For as it is known that this loss can be prevented by intelligent effort, it is only the won't-be-convinced, non-thinking orchardist who will not put spraying into practice. This gives the energetic and progressive man an immense advantage. The demand for inferior fruit does not pay expenses, because it has no chance of sale alongside the choice fruit. Spraying, of course, means work, and disagreeable work ; but it pays for itself in the increased market price obtained for the fruit.

However, the work must be done intelligently, or the time and labour are wasted. Thorough, intelligent spraying means the use of a good spray pump and outfit, and above all, a knowledge of the enemies to be treated, and of the remedies found to be most effective, their preparation, and the proper time for the application. Prevention of fungous diseases is possible ; but their cure is hardly practicable. When failure occurs, it may generally be attributed to the lateness of the application. Spray in time, and study the subject fully.

Spraying is not a cure-all. It will not bring back life, nor restore the leaves after they have been eaten off by caterpillars. The best results are not always obtained the first year, especially when spraying for fungous diseases. Success in spraying will only be found by thorough attention to details. The spray must actually reach every point which it is intended to protect.

In applying winter sprays, a coarser nozzle can be used than for summer sprays, because the object is merely to form a complete coating of the spray over the wood. In summer spraying, however, an exceedingly fine, mist-like spray reaching every portion of the plant, and covering with minute dots, preferably no larger than a pin's head, every square inch of the foliage, is necessary.

The nature, causes, and remedies for pests and diseases are often very uncertain; therefore unscrupulous people attempt to make money by selling quack remedies. Be very careful, in buying mixtures, to obtain them from reliable firms only, and after they have been thoroughly tested.

Fungoid Diseases.

Most diseases of plants are caused by low forms of vegetable life known as fungi, which live upon and within the tissues of the higher plants. The main difference, other than size, between the fungi and the higher plants, is the lack of the green colouring matter so abundant in the higher order of vegetation. The methods of development in the fungi are often different from those of higher plants, and their microscopic size renders their study more difficult. The parasitic fungi spend the winter months mostly within the living and dead vegetable tissues, and during the early spring days send out small spores, which correspond to the seeds of the higher plants. These spores are disseminated by the wind and other agents from plant to plant. With favourable conditions as to moisture and warmth, the spores send out small branches, which penetrate into the living tissues of the higher orders of plants. By the application of a fungicide to a plant, we destroy the spores which have found lodgment upon it, and thus prevent the development of additional spores, which would cause disease. Just as long as the tissues of plants are covered with a thin, even coating of fungicide, very few fungi can develop upon them. Thus, if a fungicide is applied at regular intervals of about two to four weeks during the spring and early summer, most of such plant diseases may be held in check. A fungicide is a preventive, and its application should begin long before the disease has advanced far enough to manifest itself to any extent.

Orchardists should profit by the experience of former years, and when grape vines or apples, &c., are affected any year with black spot or other fungous disease, they should begin spraying with a fungicide the following season, long before the time of the appearance of the disease.

Leaf-eating Insects.

There is a great difference in the manner in which insects take their food. Some eat the leaves, while others suck the plant juices. Orchardists must know to which of these two classes a particular insect belongs, in order to know what remedy to apply. Insects which eat the leaves have their mouth-parts formed for biting off pieces of vegetable matter, and in this way eat their food in much the same manner as do the higher animals. The insects which suck the plant juices, have their mouth-parts formed into a beak, which is inserted into the plant tissues. The most notable amongst insects which chew their food are the Codlin Moth and Vine Caterpillar. These insects can be destroyed by a stomach poison (insecticide)—a poison which kills the insects when taken into the stomach along with the particles of food. We apply this class of insecticide to the plants, making no effort to apply it directly to the insects.

Scale Insects.

These are small, sucking insects, which must be killed by a contact insecticide, applied directly upon them, which will kill them by penetration and irritation. Hydrocyanic acid gas is also used, and has proved most efficient.

Plant Lice.

These are the insects so common upon a great variety of plants throughout the early spring and summer. They may be green in colour or black, such as Green Aphis or Black Aphis. Some are red. Plant lice may or may not have wings. The most common forms during the summer months are the wingless females, which produce living young; winged males generally appear in the autumn. Aphides are the most common form of plant lice, and the treatment for them is an external irritant insecticide.

Materials Used in Spraying.

Fungicides are materials used in destroying fungi, which are low forms of vegetable life causing disease in plants. Correctly speaking, the fungicide acts as a preventive of plant disease, by obstructing the germination of the spores of the fungi causing such disease. These spores grow upon the exterior portion of plants. If we cover the plants with a coating of a copper salt, such as bluestone, or other chemical injurious to the germination of the spore, the reproduction of the fungi is held in check.

Insecticides are those substances used in destroying insects. The materials used in spraying are divided into two classes: the internal poisons and the external contact irritants, known also as the internal and external contact insecticides. Internal poisons are only used for those insects that bite their food; and they kill because of their poisonous action. The external contact insecticides act by their penetrating and irritant qualities. These are used against all insects whose mouth-parts are formed for sucking.

The principal fungicides used are as follow :—

Lime-sulphur solution :
Bordeaux mixture :
Ammonio-carbonate of copper.

The principal insecticides, and those which have proved the most efficacious, are as follow :—

Arsenate of lead—internal poison, for leaf-eating insects.
Bordeaux, arsenical—combined insecticide and fungicide.
Kerosene emulsion—external contact irritant, for scale insects and plant lice.
Lime-sulphur wash—external contact irritant and fungicide, for scale insects and plant lice.
Resin wash—external contact irritant, for scale insects and plant lice.
Washing soda ,, ,, ,, ,, ,,
Tobacco solution ,, ,, ,, ,, ,,
Fumigation—causes suffocation and death.

Spray Pumps and Outfits.

The particular outfit to be selected for spraying purposes will depend altogether upon the amount and character of the work to be done. Numerous pumps are made for the special work of spraying. A pump simple in construction is to be preferred. No one outfit can be expected to suit all the varying conditions of spraying. Hand-pumps should give great pressure with the least expenditure of power. All working parts should be made of brass, and easily taken to pieces. No type of spraying outfit is more widely used, or has given better satisfaction, than the barrel-pump. There are a great many different makes on the market, of which many are efficient and successful. They are mounted in a great many ways. An ordinary 50-gallon whisky barrel forms an excellent and inexpensive tank for holding the spray. The pump, according to its design, may be inserted in the end or the side of the barrel. The barrel may be mounted, to suit the operator, on a slide, or on two wheels, or it may be placed in a cart. Power pumps are coming into more general use, as they are more economical and do better work than the hand pumps.

Hose and Nozzle.

Nothing contributes more to success in spraying operations than good hose and nozzles. In ordinary spraying operations half-inch hose is generally used. Good three or four-ply hose should be bought. It never pays to use cheap hoses in spraying, as they are subjected to a great deal of rough handling. Above all, have plenty of length of hose when spraying—25 to 30 feet at least should be used.

The couplings should be of a style readily adjusted, and everything must be kept tight to withstand pressure.

Nozzles.

One of the most important parts of the whole apparatus is the nozzle. Good results in the application of the spray mainly depend upon its efficiency. For general use, the best nozzle is the Vermorel, or one of that type. The four most commonly used nozzles are as follow :—

The Vermorel.—This nozzle undoubtedly throws the finest spray of any. It should be held quite near the foliage or branches, as the liquid is not thrown out with much force.

The Bordeaux.—This is a splendid type of nozzle. It has the advantage over all others in that the character of the spray is readily changed from a solid stream to a mist-like, fan-shaped spray. If there is any clogging of the nozzle, it is easily remedied by turning the handle, thereby forcing out the obstruction with the pressure of the pump.

The Cyclone.—The spray from this nozzle is conical shaped, similar to the Vermorel.

The Friend.—This nozzle is coming largely into favour.

Extension Rods.

The ends of the hose should be attached to extension rods of suitable lengths for the work. For all lengths above 6 feet a bamboo extension rod is recommended. This consists of a small brass tube, supported by a bamboo rod.

Taps.

On the extension rod a tap is generally placed for turning the liquid on or off. For this a $\frac{1}{2}$-inch wheel valve is convenient.

The Agitator.

All pumps should be fitted with good agitators. The proper agitation or intermingling of the spray liquid is one of the chief features in spraying, and unless it is thoroughly done, good results will not be obtained.

Care of the Outfit.

A spray-pump, like any other machine, will do good work, and last in proportion to its care. When a pump does not work properly, the cause of the trouble should be ascertained at once, and remedied, otherwise permanent damage may result. When a spray-pump is first received, its working parts should be carefully studied. After the pump has been used, it should be thoroughly washed out with warm water, as most of the spraying mixtures are highly corrosive in their action. The hose should also be thoroughly washed out, and especially after using oil sprays. Always keep the barrel filled with water when not in use, to prevent the wood from warping and hoops becoming loosened. With proper care the pump should last several years; the hose, however, will probably have to be replaced after one or two seasons.

Spraying "Don'ts."

The orchardist will do well to carefully consider the following points :—

Don't fail to spray *every* season. It is impossible to determine in advance whether or not the tree will be attacked. Proper spraying is *never injurious*.

Don't fail to follow carefully Spray Calendar and formulas. If you do not, it would be better not to spray, as you are liable to do more damage than good.

Don't wait till the fungi have attacked plant or tree ; the fungicides are merely preventives and should be used early in the spring. After the disease has developed. it may be too late to save the plant.

Don't spray during or just after a shower, or when there has been a heavy dew. Much of the solution will be washed off or it will collect in spots. Wait till the leaves are dry. Poison is more effective when applied to the leaves when dry.

Don't spray on top of the leaves only ; spray the under sides where the pests hide, and be particular to keep your liquid thoroughly agitated.

Don't give up spraying because you do not think you see any benefit from your work. Perhaps you did not spray early enough to prevent the damage ; perhaps you did not use the right formula, or were not careful in its preparation ; perhaps you did not spray thoroughly or often enough. Try again.

Don't buy a cheap sprayer. It will always be out of order. It will make the labour many times greater, and in the end will cost more than a good one.

Don't buy a bucket sprayer and expect to spray an orchard with it. Buy a sprayer large enough to do your work quickly and easily.

Don't put your sprayer away after using it until you have thoroughly cleaned out all the spraying mixture. If this is left in, the pump will be injured and the glands and valves clogged.

Don't start out to spray until you have carefully examined your sprayer to see that it is in good working order.

Don't leave your sprayer where it will freeze, unless all the liquid has been drained from it. If liquid has been frozen in the pump, it is liable to break iron cylinders or expand brass cylinders, so the pump will not work.

Don't spray only the trees from which you expect to get marketable fruit. Spray *all* the trees, otherwise the trees you go to the trouble to spray early in the season may become infected later by the unsprayed trees. "An ounce of prevention is worth a pound of cure."

Profitable Turkey Breeding.

G. BRADSHAW.

WHILE the past few years have witnessed annually increasing prices for poultry of the various sorts, turkeys of all others have shown the greatest advance, up to 1s. 3d. per lb. live weight, and 2s. per lb. dressed, being a current rate for several weeks prior to Christmas last.

The very good prices ruling for the whole year were due to several causes, but chiefly the excellent local and export demand.

Australia never has produced geese largely, the climatic conditions not being always favourable to their natural diet of succulent grass. But the giant of the poultry yard—the turkey—has here, as in almost every country since the inception of cold storage, ousted the goose as a Christmas dish. Thousands that are consumed at that time have been kept in the cool rooms for many months previously.

Another feature contributing to the profitableness of turkey-rearing is the facilities now available for the disposal of the birds. Time was when the bulk of them were either transported to Sydney in railway trucks, the length of time in travelling being usually responsible for numerous deaths, while the nature of the birds is such that deprivation of food and water for a couple of days causes a wasting, and a general depreciation in price.

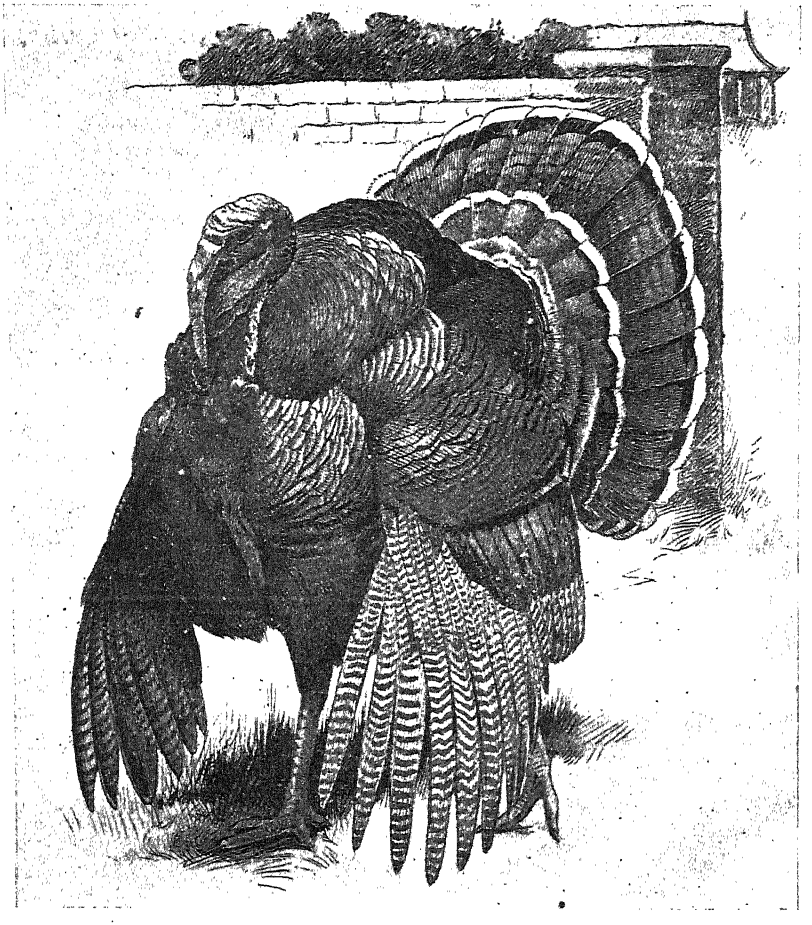
The Railway Commissioners now supply suitable coops, though the lengthened time of transit cannot be got over. Even this, however, has now largely changed; and the very excellent demand for the eastern export trade, the bulk of which leaves here in September and October, warrants exporters exploiting the turkey-breeding districts several months earlier than in the past, and owners are now offered so much per lb. live weight at the country freezing works, where they are weighed and paid for, thus saving freight, commission, losses through mortality, &c.

At districts as far apart as Braidwood, Gunnedah, Tumut, Young, and about a dozen other places, the birds are purchased, dressed, frozen, and stored awaiting shipment from the works, and finally forwarded in refrigerating cars to the ship's side, or, if for the Sydney trade, to one or other of the cold stores there. Last year at the Young works alone over 3,000 were treated.

A few years ago, when this country killing and dressing was commenced, quantities of turkey hens could have been had for about 3d. per lb., and gobblers for ½d. or 1d. more. Now double that amount is a current rate, while should they be held over to near the end of the year, considerably higher rates obtain. Indeed, 40s. to 50s. per pair was quite a common figure for many weeks prior to last Christmas.

Handicaps to the Industry.

With such prices it can be readily assumed that turkey-breeding has become a profitable business of late years. Coincident with the improved demand and good markets, handicaps have arisen.



Bronze Turkey Cock. [From "Poultry."]

In consequence of rabbit poisoning, in many districts where at one time scores of broods were reared, the industry has now almost disappeared. In others, foxes are responsible for depleted flocks; and a third trouble is a disease, known as "Blackhead," which has been imported from America.

There are, however, districts that are still free from all these troubles, and those who during the past season gave attention to this industry, need not hesitate about increasing the production, for there seems little doubt that the high prices will obtain in the ensuing season.

Breeding.

There are several breeds of turkeys, the principal in Australia being the American Bronze, the balance being largely crosses of this with a small mongrel sort, the descendants of the original Cambridge or Norfolk.

There is no doubt that the American Bronze, owing to its great size, pays best, particularly as the majority of birds are now purchased at so much per pound. The breed has been useful in improving the size of the common kind, and the infusion of new blood has also been beneficial in imparting stamina.

Turkeys are very liable to disease, a contributing cause being the in-breeding which has been practised by the majority of those who keep them. These inbred birds are most delicate, and are subject to some complaints of their own, as well as the many others to which fowls are liable.

For this reason, whether common hen turkeys are used for breeders or pure Bronze, it is always best to secure new blood regularly.

Turkeys are not good layers, although it is said they have improved within recent years. Just like fowls there are very poor producers among them, some specimens laying as few as twenty eggs in the year, while others have reared three times that number of chicks. As a rule they do not lay early in the year, and when they do the eggs should be set, as the poults will then have the advantage of the spring weeds, seeds, and insects which are of the greatest importance to young turkey life.

The Conditions of Success.

Of all the sorts of domestic poultry, it is generally acknowledged that turkeys are the most difficult to bring to the adult age, the young birds in the early stages requiring very special care until they get over the period termed "shooting the red." Indeed, the great trouble experienced in rearing deters some farmers from venturing on this business, which to many is a most lucrative one. In other words, many have tried turkey-breeding, with results so disastrous as to rearing, that they have given it up in disgust, while others have experienced less trouble in bringing the poults to maturity than with ordinary chickens. Success depends more on the natural conditions and place of rearing than on the breeder's experience.

Turkeys are the semi-wild fowl of the farm, and the rougher and more uncleared the country the more simple is the rearing. Atmospheric and soil conditions both affect the young birds for good or ill. People do not select land on account of its suitability to the rearing of turkeys—larger issues are the determining factors—but in other countries these feathered giants have been and are successfully reared in places and under conditions which many poultrymen would consider quite adverse. As the 300,000 square miles of this State embrace soils, temperatures, and other conditions similar to those obtaining in every country where turkey culture is carried on, a description of the methods generally adopted should be of some use to those who purpose attempting this branch of the poultry industry.

It is not an easy matter to raise turkeys with any degree of certainty on a heavy clay soil or in a wet district, although there are places where turkey

breeding is successfully carried on under the most adverse conditions. Turkeys are usually hatched in the natural way. Incubators have been used with a certain amount of success, but the great difficulty is that the young turkey chicks seldom thrive in foster mothers, and it is not always that a hen will take to them. All things considered, it is best to hatch by means of a broody hen.

Rearing the Poult.

When the chicks are hatched and are dry, they should be moved, together with the hen, to a coop—a double one, if possible—and the hen shut in one side, while on the floor of the other part chaff should be scattered, in order to afford the birds exercise.

The first thing to remember is that the crops of the turkey chicks are very small, so that they require their food in small quantities and often—every two hours for the first week or so will be none too frequent. The food for the first three or four days should consist of hard boiled eggs, mixed with bread crumbs or coarse oatmeal. The egg may be stopped after three or four days if the young birds seem to be doing well, but it is nearly always advisable to keep on with it for at least a week. There is one essential to successful turkey-rearing, and that is plenty of onions. The best plan is to chop them up and keep them continually before the birds. Meat also should be supplied, and green food of some kind, young lettuces being the best. Such foods should be given to the turkey chicks until they are from eight to ten weeks old, when "shooting the red" takes place, after which the most trying period is over. Then, if the young birds are put on the grass and supplied with plenty of good food, mostly soft, with some grain now and then at nights, there is no reason why they should not thrive, and amply repay all the time, trouble, and expense, when Christmas comes round.

Turkeys should have a house to roost in which is apart from other poultry, and free from draughts, but with plenty of ventilation. Their natural roosting place being on the branches of trees, warmth is not required—in fact, it is very detrimental to their health, causing them easily to take cold. A house made draught proof on three sides may with advantage be covered with wire netting on the other side, thus preventing any over-heating. Their perches should be at least 3 inches broad, and without sharp edges.

From five to ten hens are sufficient to mate with one gobbler, and to obtain the best results, pullets in their first year should be mated with a gobbler of the second year, and hens of over one year with a vigorous young cockerel. Turkey cocks arrive at maturity after the moult in their third year, after which they are not to be relied upon as stock birds.

Care during Incubation.

The turkey hen generally prefers choosing her own nesting place, but every inducement should be given to lay where desired by preparing suitable places for her, and it will be found that where she lays her first egg the succeeding ones will also be laid. The hen turkey generally lays from fifteen to twenty eggs before becoming broody. It is therefore advisable to put about

seven of her eggs under a reliable broody hen, when the turkey herself will be able to hatch the remainder, thirteen or fifteen eggs being a fair setting for her. The nest should be in a quiet, secluded place, where she will not be disturbed, and preferably made upon the ground. Both hens and turkeys are most liable to become infested with vermin during incubation, and every effort should be made to prevent this. If set in a box it should be well lime-washed, and the hens should be dusted with insect powder. A dust bath of dry ashes well sprinkled with sulphur should be provided. The hen should be fed once a day during incubation, maize, wheat, or barley being suitable, and some green stuff must also be supplied.

The turkey hen, being of a shy disposition, should be interfered with as little as possible, and only by her regular attendant, otherwise she becomes fidgety, and may break her eggs. As a rule she is an excellent sitter; in fact, she is apt to starve herself by sitting too close, and she must be carefully watched to prevent this. In very dry weather it is necessary to damp the surroundings of her nest with a little water. If the hen has set well, the chicks will begin to break the shells on the twenty-eighth day, when the attendant must watch the nest, and remove all empty shells: but if the mother is quiet, the chicks are best left with her until they are a day old.

Turkey breeding is successfully carried on at the Wagga Experiment Farm, the following being the poultryman's formula for rearing poults:—

The most successful feeding for poults at Wagga has been coarse oatmeal, or pollard and bran, just sufficiently moistened with water or milk to slightly adhere, together with curdled milk as available, for the first four days. Then small-ground grains or pollard and bran may be given as before, but mixed moister as the birds grow. Turkeys do not take readily to any change of food. The use of milk is strongly advocated, in any form and at all ages. Full grain is often eaten by turkey chicks at an early age; but it is not advisable to give it until after the third week, when it should be soaked in cold water for twenty-four hours beforehand.

Meat food in some form is necessary. Green bone is supplied at Wagga in small quantities daily after the first week. Should it not be obtainable, a plentiful supply of broken shell of some kind should be within their reach, or small quantities of unslacked lime put in the drinking water.

Four feeds a day are necessary in the early stages; then three a day till full grown. Charcoal in small pieces should be available. The drinking water should be clean and cool, and provided in shallow tins; otherwise the young turkeys will drown themselves.

The period when the chicks require the mother turkey's assistance is marked as ended when red appears on their heads and necks. The old turkey will then be found enticing them on to high roosts; but the hens are very faithful, remaining with their broods till they are grown up, unless it is early in the season, and they sit again.

The turkey statistics of the State for the past five years may be of interest. The increase is considerably less than with fowls and ducks, owing largely to the three handicaps previously mentioned.

	No. of Turkeys.		No. of Turkeys.
1907	... 211,556	1910	... 244,456
1908	... 193,613	1911	... 232,500
1909	... 224,187		

It will be seen that, although there was a small decline in production in 1911 from the previous year, the number recorded was considerably greater than in 1907, and there is scarcely a doubt that were it not for the drawbacks already referred to, the increase in production would be equal to that of fowls and ducks.

Those desiring further information should apply to the Acting Under Secretary of Agriculture for Bulletin No. 40, "Turkeys In health and disease."

Export of Apples from the Bathurst Experiment Farm.

DURING the past year further shipments of apples have been made from the Bathurst Experiment Farm to test markets in other parts of the world. As shipments to Java realised satisfactory prices in 1911, four consignments were made to Batavia last year in the months of March, April, May, and June. The prices realised are satisfactory, and the net price received for the four shipments averaged 6s. 10d. per case at Bathurst. About 200 cases per month were sent through the Java Cold Storage and Eastern Trading Co. (Limited), of 20, Loftus-street, Sydney. The full results are published for the benefit of growers.

The First Shipment.

This consignment comprised the following varieties :—

Cleopatra	96 cases	Stone Pippin	10 cases
Munroe's Favourite... ...	50 ,,	Five Crown	14 ,,
Jonathan	20 ,,		
Granny Smith	10 ,,	Total	200 ,,

These were shipped per s.s. "Montoro" on 2nd March, 1912, and the following report was received from the Batavian office of the company :—

The first shipment arrived rather green, and had to be cold stored. We would further draw your attention to the fact that, unlike the Australian and European markets, the fruit has to be practically retailed in Java—that is, sold in case lots, in order to secure the highest possible returns.

The prices realised ranged from 11s. 8d. to 20s. 10d. per case, and the following statement shows the items :—

	£ s. d.	£ s. d.
Gross proceeds total	.....	177 5 10
Charges at Batavia and Sydney are as under :—		
Batavia—Duty	9 0 0	
Landing and receiving	1 13 4	
Railage and Coolie hire	1 17 4	
Insurance	0 0 9	
Storage from one to twenty-two weeks ...	24 8 6	
Delivering	0 15 0	
Commission, 15 per cent.	26 11 10	
Sydney—Freight prepaid	21 17 6	
Marine insurance...	0 6 9	
B/L and petties	0 2 6	
1 per cent. exchange on draft	0 18 0	
		87 11 6
		£89 14 4

The net price Sydney is 8s. 10⅛d. per case. The charges from Bathurst to Sydney amount to 1s. 6¼d. per case, which includes cases, wrapping paper, rail freight, and cartage from railway to ship. The price, therefore, realised in packing shed, Bathurst, is 7s. 4d. per case.

The Second Shipment.

This was forwarded per s.s. "Mataram" on 1st April. The varieties were as follow:—

Granny Smith	... ...	42 cases	Stone Pippin	... ...	89 cases
Rome Beauty	... ...	119 ,,			
			Total	... ...	250 cases

This consignment realised from 14s. 2d. to 19s. 2d. per case, and the various items are as follow:—

	£	s.	d.	£	s.	d.
The gross proceeds amount to	.....			216	11	8
Charges are as under:—						
Batavia—Duty	11	0	0			
Landing and receiving	2	1	8			
Railage and Coolie hire	1	13	0			
Insurance	0	0	3			
Storage, four to sixteen weeks	24	9	6			
Delivery	0	6	4			
Commission, 15 per cent.	32	9	9			
Sydney—Freight to Batavia	23	10	11			
Marine insurance...	0	7	6			
B/L and petties	0	2	6			
1 per cent. exchange on draft	1	4	0			
				97	5	5
				£119	6	3

The net price Sydney is 9s. 6½d. per case. The charges, Bathurst to Sydney, as before, amount to 1s. 6¼d. per case, which leaves 8s. as net return at packing house, Experiment Farm, Bathurst.

The Third Shipment.

This was forwarded per s.s. "Montoro" on 1st May, and contained the following varieties:—

Granny Smith	... ...	88 cases.	Munroe's Favorite	... ...	42 cases.
Rome Beauty...	... ...	33 ,,			
Stone Pippin ...	... ...	37 ,,	Total	... ...	200 ,,

The prices realised from 15s. to 20s. 10d. per case, and the net price Sydney is 8s., or 6s. 6d. at Bathurst. The account sales are appended:—

	£	s.	d.	£	s.	d.
The gross proceeds amounted to	.....			174	16	8
Batavian charges—						
Duty	9	0	0			
Railage and Coolie hire	2	1	8			
Landing and receiving...	1	5	0			
Insurance	0	2	1			
Delivery	1	13	4			
Storage	31	3	8			
Commission, 15 per cent.	26	5	0			
Sydney charges—						
Freight prepaid...	21	17	6			
Marine insurance	0	8	7			
B/L and petties...	0	2	6			
1 per cent. exchange on draft...	0	16	3			
				94	15	7
				£80	1	1

The Fourth Shipment.

The final consignment for 1912 was despatched per s.s. "Mataram" to Java on 1st June. Two varieties only were included, viz., Stone Pippin and Granny Smith. The prices obtained were somewhat lower than those of previous shipments, and netted 7s. 0¾d. per case at Sydney, or 5s. 6½d. at Bathurst.

	£ s. d.	£ s. d.
The gross amount received was	.....	158 15 10
Charges are as under—		
Batavia—Duty	9 0 0	
Railage and Coolie hire	2 10 0	
Landing and receiving...	2 1 8	
Insurance	0 3 4	
Delivery	1 13 4	
Storage	26 3 11	
Commission, 15 per cent.	23 16 4	
Sydney—Freight prepaid	21 17 6	
Insurance	0 5 3	
B/L and entry	0 2 6	
1 per cent. exchange on draft	0 12 0	
		88 5 10
		£70 10 0

Summary.

While it is obvious from the foregoing statements that the charges incurred in exporting apples to Java are very high, the net prices realised afford a handsome margin of profit for the grower. Doubtless the costs will be materially reduced when the fruit export trade to Java is properly organised, and regular shipments assured, and there can be no danger of over-production with such a profitable outlet close to our shores.

Treating Unfruitful Orange Trees.

A report has been received from Mr. O. Brooks, Fruit Inspector in the Gosford district, in regard to ringing navel orange trees with the object of making them set their fruit. Mr. Brooks says: "A number of the trees treated had never carried a crop of fruit previously, but this season, having been ringed, are bearing good crops, and trees which were not treated have very little fruit on." He also states the most successful way of treating the trees is by making a spiral incision, and taking a piece of bark about one-eighth of an inch wide right out. The operation should be done when the trees are just coming into full bloom. He has seen trees twelve years old, which have never borne fruit, treated in this way, with very satisfactory results.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS.

Branch.	Honorary Secretary.
Albury	Mr. J. D. Lankester, Albury.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Beckom	Mr. S. Stinson, Beckom.
Bonville	Mr. H. B. Faviell, Bonville.
Bungalong	Mr. E. Hughes, Oakleigh, Cowra Road, *viâ* Cowra.
Cardiff	Mr. F. B. Cherry, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Collie	Mr. C. J. Rowcliff.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coreen-Burraja	Mr. Wm. Stodart, Coreen, *viâ* Corowa.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Deniliquin	Mr. W. J. Adams, jun., Deniliquin.
Derain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. Duffy, Henty.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	Mr. C. F. Boughton, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Portland	Mr. G. Gosper, Lower Portland.
Mangrove Mountain ...	Mr. G. T. Hunt, Mangrove Mountain, *viâ* Gosford.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Moruya	Mr. P. Flynn, Moruya.
Narrandera	Mr. C. F. Pearce, Narrandera.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
New Italy	Mr. F. A. Morandini, New Italy.
Nimbin	Mr. J. H Hutchinson, Nimbin.
Orangeville	Mr. C. Duck.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkes	Mr. John E. Russell, Parkes.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose-Kareela	Mr. L. Pieremont, "Vila," Penrose.
Quirindi	Mr. H. A. D. Crossman, Quirindi.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Spring Hill	Mr. J. A. Henry, Spring Hill.
Stockinbingal	Mr. J. Neville, Stockinbingal.
Tallawang	Mr. J. E. Hansall, Tallawang.
Toronto	Mr. J. G. Desreaux, "Esmond," Toronto.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the Branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Demonstrations in Clearing Land and Subsoiling with Explosives.

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. H. C. Coggins, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Demonstrations in Orchard Operations.

Arrangements have been made for Mr. J. G. Bryant, Assistant Fruit Expert, to give demonstrations on pruning and grafting, and information *re* winter spraying, to members of the following branches :—

Kellyville, 8th May.
Wetherill Park, 10th May.
Carlingford, 17th May.
Sackville, 20th May.
Lower Portland, 21st May.

NOTES AND REPORTS FROM BRANCHES.

Albury.

Instead of holding the usual monthly meeting, members of this branch decided to make a trip to the Wagga Experiment Farm. On the 5th March a number of members entrained at Albury for Wagga. The hon. secretary reports having had a very instructive and pleasant time.

Cardiff.

At the monthly meeting of the above branch, held on the 15th March, Mr. J. Horsfield addressed the members on the advantages accruing from spraying with red oil. A practical demonstration was arranged for a later date.

Carlingford.

Fumigation *v.* Spraying was the subject of the discussion at the monthly meeting of this branch, held on the 15th March. Mr. John Neil was in the chair.

Fumigation v. Spraying.

Mr. Tunks thought that, if properly carried out and the conditions were suitable, fumigation gave the best results.

The Chairman stated he had recently inspected fumigated trees in the orchard of Mr. Geo. Hughes, and was not favourably impressed with the results obtained. In the same orchard it was costing £4 10s. to fumigate sixty trees. Five times as many trees could be sprayed for the same money. Spraying was easier, more pleasant to carry out, and cheaper than fumigating. He had sprayed apple trees badly affected with red scale, with red oil jelly, and though half the foliage came off, the scale was killed. The oil was mixed in the proportion of 1 to 40, combined with a little soda and soft soap and a bundle of green bushes. He had sprayed for a Mr. Black trees affected with red scale, white louse, smut, and Indian wax scale, using a spray composed of bush leaves, kerosene, soda and soft soap, and these trees were now absolutely clean, as were also some trees (lemons) which were in a similar condition and were treated in the same way.

Mr. Franks gave his experience in spraying with red oil He had yet to learn that Indian wax scale could be killed by fumigation after it had reached a certain stage. Spraying was undoubtedly cheaper than fumigation, though he believed the latter to be the more effective method for thoroughly cleaning an orchard.

The Chairman believed that all diseases could be eradicated with red oil spraying. He mentioned the case of some trees sprayed three months ago with lime sulphur, mixed with muddy water, with the result that they were now clean. He thought a lot depended on the force with which the spray hit the tree. He used a fine nozzle, and wetted the trees thoroughly.

Mr. Mobbs stated he used a spray of 8 lb. of resin, 8 lb. of soda, 8 lb. of soft soap, and 32 gals. of water, with the most satisfactory results, particularly as regards red scale.

The Chairman advised Mr. Mobbs to add a bundle of green bushes to his spray when boiling the mixture, as the eucalyptus and sap would make it more effective.

The Use of Explosives in Agriculture.

Mr. Fry explained the method of using gelignite in (1) preparing the ground to lay out an orchard and in (2) renovating an old orchard. Mr. Fry also gave particulars as to the use of explosives for clearing purposes.

Coreen-Burraja.

A demonstration in clearing land and subsoiling is being arranged for by Mr. H. C. Coggins, Assistant Inspector of Agriculture.

The March meeting was held at the Coreen Public School. About twenty members were present, and the President (Mr. D. W. Swan) occupied the chair.

It was resolved to hold a smoke social in July in connection with the Bureau.

Mr. Robert McKenzie read the following paper :-

The Marketing of Wheat.

As a community of farmers, meeting for the purpose of bringing forward matters of mutual interest to us as producers, there is nothing of so much importance to the man on the land as the handling and marketing of his produce. It is his all, in fact. If so much of the value of his produce goes in freights and commissions, as is the case at

present, it is only a matter of a very short time when he will have all his profits absorbed by these items. To us the most vital question is wheat. There has been a general rise in freight for shipment to British and European ports of 6d. per bushel over last year's rates, or, in other words, £75 per 1,000 bags. In this district I should say there were 300,000 bags of wheat grown, so these foreign-owned ships took from us this extra sum of about £22,000, a very large sum of money to be extracted from the pockets of farmers in this small district. So what is the amount drawn from the State? I see by the revised figures issued by the Government Statist that the estimated yield would be some 24,000,000 bushels, though the wheat in sight to date is not more than 16,000,000 bushels.

There is one peculiar thing in connection with this rise in freights from 26s. to 39s. 3d. per ton on sailers, and on steamers from 29s. 9d. to 43s. 3d. per ton. I have not seen one comment in the metropolitan daily papers on the matter, outside their commercial columns, which is strange, considering the amount of space they give to the mere flea-bite of a possible rise of 10s. per week in the wages of a harvest hand. Possibly the reason is that the big shipping companies advertise largely in their columns, and the farmer and his man do not. I do not say that the farmer and his man should not be discussed, for every penny of his outgoing must be closely watched if a farmer is to know where he stands. The question now is: Where is this enormous amount of expense in freight to be cut down, and how?

Well, my idea is that the State should own or control a fleet of cargo steamers to carry our produce to the markets of the world. The question then is: Will it pay? I say unhesitatingly, "Yes."

The State holds the whole thing in the hollow of its hand. For this reason practically every bag of wheat is brought on the Government trains. Let them take a leaf out of the book of those thorough-going, far-seeing Germans, who stand no agents on commission on any goods which come down on their lines for shipment; they do it themselves. Any shipping company which will not carry goods at a reasonable rate will get no freight in a German port, nor will they get any of their goods carried on any of the Government railways; so, consequently, German farmers and manufacturers are not worried the same as we are. A very pointed instance of this came before the Empire Trade Commission, sitting in Dunedin, New Zealand, when a member of the local Chamber of Commerce gave evidence of how the British ship-owners favour the German manufacturers, citing the case where German goods shipped at Hamburg, transhipped at London, then to New Zealand at 29s. 6d. per ton, while British goods shipped direct from London cost 40s. per ton, specifying an instance where his own firm got exactly the same goods from Hamburg, *via* London, and London direct, the German goods freight was 23s. 6d. per ton, while the British goods cost 30s. per ton direct So, I think, gentlemen, it ought to be pretty plain to us what we, as farmers, want, and keep an immense fortune for ourselves, to say nothing of the 330,000 bales of wool on which we pay on an average of over 1d. per lb., about 2,000,000 of frozen sheep and lambs, and thousands of tons of butter and other produce. I ask you, fellow farmers of New South Wales, why do we give millions away to the other fellow when we want it for ourselves, our wives, and families, so as to make our lives a little brighter and happier?

There is nothing new in making customers patronise the railways of this State. Possibly every farmer knows that wheat stacked in any railway yard in this State must pay a freight to the Railway Department whether it goes on the rails or not. So, when the Department says to its own farmers, "Here, if you make use of our yards and sheds pay for them," it is only a very short step to say to the foreign shipowner, "Well, if you cannot carry the goods of this State at a reasonable price, you shall not get any of our goods to carry, nor will we carry any of yours." I may here state that the State railways are the only carrying concern in this country which has not raised its freights and fares, and still they can show a profit; so it is pretty plain that we are being fleeced by the shipping companies.

After some discussion, during which the views expressed were favourably commented on, a vote of thanks was passed to Mr. McKenzie.

Deniliquin.

A branch of the Agricultural Bureau has been formed at Deniliquin. The following gentlemen were elected office-bearers for the ensuing year: Chairman, Mr. M. J. Corew; Vice-Chairmen, Messrs. W. Nisbet and A. E. Matthews; Treasurer and Secretary, Mr. W. J. Adams, junior.

A meeting was held on 28th March at Pretty Pine.

PICKLING SEED WHEAT.

The above formed the subject of discussion, and those present related their experiences. Several farmers advocated putting a bag of wheat into a wooden trough, and sprinkling it with ½ lb. of bluestone dissolved in a little water, at the same time turning the seed over with a shovel until the solution had been thoroughly mixed with the wheat. The majority of farmers, however, advocated the dipping of 1 bushel butts into a solution of bluestone. The departmental pamphlet on the matter was then read and it was found that only *one* farmer of those present followed the directions of the experts.

DEPARTMENTAL NOTE.—It is of the utmost importance, says Mr. H. Ross, that farmers should pay close attention to the pickling of their seed wheat. The methods adopted in the majority of cases are too haphazard, and many unexplained failures may be attributed to incorrect and faulty methods of pickling.

The seed should be placed in 1-bushel butts and dipped for three minutes into a solution made of 10 gallons of water and 1½ lb. of bluestone, giving the bag several vigorous shakes. (The 2 per cent. solution, *i.e.*, 10 gallons of water and 2 lb. bluestone, is not now recommended.) The butt should now be allowed to drain for a few minutes and then be immersed for a few seconds in clear lime water. This lime water is made by stirring 1 lb. of unslacked lime into 10 gallons of water. The solution should be allowed to stand until the sediment has fallen to the bottom ; the clear lime water should then be decanted off, and into this the bluestone wheat should be dipped.

Great care must be exercised not to pickle and sow wheat containing *unbroken* bunt balls. Should the seed contain unbroken bunt balls the wheat can be tipped into a large vat of water, when the bunt balls will float to the surface, when they can be skimmed off.

Forest Creek.

The usual monthly meeting of this branch was held early in March. After the usual formal business a discussion took place on Mr. Stening's lecture on wheat growing.

Inverell.

Mr. J. W. Mathews, Sheep and Wool Expert, gave a demonstration on flock raising at Messrs. Kook Bros.' farm, Rock Mount, on Thursday, 6th April, and though only a few sheepbreeders turned up, owing to the P. and A. Society and Farmers and Settlers' Association having their monthly meetings on that day, nevertheless those present appreciated the sincere efforts Mr. Mathews made in order to show the great loss that occurs throughout the State yearly through breeders not interesting themselves sufficiently in sheep breeding, both for wool and mutton.

SUITABLE TYPES OF SHEEP.

In the evening Mr. Mathews gave a lantern lecture, which was better attended. Here all types of sheep were shown, and their characteristics pointed out, also a considerable number of figures showing their relative value for both wool and mutton. Mr. Mathews expressed the opinion that, given proper railway facilities, Inverell would prove one of the very best districts for fat lamb-raising in the Commonwealth, but under the present circumstances the railage journey round Moree to the central market was so great as to almost preclude the idea.

The various breeds shown on the slides consisted of Merinos, English Leicesters, Border Leicesters, Romney Marsh, South Downs, Shropshires, Cotswolds, Suffolks, Cheviots, and Dorset Horns

With these breeds Mr. Mathews has been experimenting for years, and the figures shown are a particularly good guide for the flock raiser and for a farmer possessing a small flock. Mr. Mathews recommends the Merino-Lincoln cross, being very good in both wool and mutton. He advocates selecting good robust Merino ewes showing quality, and mating with the Lincoln ram, then if the fat lamb is required, select cross-bred ewes and mate with the Shropshire ram. These lambs properly fed will give a return at five months of 10s. to 12s. per head, according to the state of the market, for freezing purposes. The Dorset Horn is probably as good as the Shropshire, and Mr. Mathews advised the farmers to try this breed with the Lincoln-Merino cross ewes, as in the test they even excelled the Shropshire regarding weight of carcase, but lost in wool value.

After the lecture those present had an excellent opportunity of examining the wool from the different breeds, also the very finest merino wool produced in the State. This collection Mr. Mathews carries with him, and is decidedly interesting. A hearty vote of thanks to the lecturer concluded a most instructive and pleasant evening, the members expressing a hope that Mr. Mathews would again visit the district in April or May for the same purpose.

In reply to a question asked, Mr. Mathews stated that in the event of any of the lambs raised from either South Down, Shropshire or Dorset Horn sires, not being forward enough in condition to market off their mothers, say at five months, it would be well to dispose of them as weaners, and not to hold them till shearing time.

Kellyville.

There was a very fair attendance of members at the February meeting of this branch and after the routine business was dealt with, Mr. Herbert James gave an interesting address on budding and grafting. Illustrating his remarks by exhibits of well prepared stocks and suitable wood for buds and grafts, he gave practical demonstrations of each step of the work and made the methods used look simple enough for any amateur to undertake.

Budding and Grafting.

Among the essentials for successful budding, the stock, he said, came first. For citrus fruit for this district, after many years of experience, he preferred the common lemon stock, peach stocks for all stone fruit, while pears, apples, quinces and persimmons were usually worked on their own stocks.

The stock should be clean stemmed and the sap flowing freely. A "T" cut being made in such a stock, on inserting the bud it should with slight pressure open its own way.

The buds should be taken from nice round stemmed (not angular shaped) wood of about six months' growth, and the bark should strip freely. The method of preparing the bud was shown, and after taking out the woody part it was inserted in the "T" cut in the stock, and tied in its place. Proper tying was one of the essentials of successful work and the speaker recommended either new calico torn into narrow strips of a suitable length or raffia fibre; with this, the bud should be tied firmly in its place—firmly to exclude all the air which gets under the bark. Care should also be taken not to bruise the stock. In twelve or fourteen days the ties should be removed; if left on too long they would injure the young and tender stock.

Methods of grafting various fruit-trees were also explained, and many questions answered relating to the work.

Mr. James urged orchardists to have more confidence in themselves and not send for a professional every time they wanted a few trees worked. There was no real difficulty in the matter of budding or grafting, and practice would soon make one competent to convert a useless and unprofitable tree into a profitable one.

At the close, a hearty vote of thanks was accorded the speaker for a very useful and interesting address and demonstration.

Leech's Gully.

The monthly meeting was held on the 17th March, when seventeen new members were enrolled.

It was decided to form a library of books dealing with agricultural subjects. A quantity of lucerne seed is being purchased by the committee for distribution amongst members.

Narrandera.

The members of this newly-formed branch paid a visit to the Yanco Experiment Farm early in March, where they were shown round the farm and entertained by Mr. Chomley, the Manager.

The visitors, through their honorary secretary, expressed themselves as very satisfied with what they saw on the farm, and considered the trip an educational as well as an enjoyable one.

The first meeting of this branch was held on March 22nd.

Wheat *versus* Oats.

A discussion took place in reference to wheat *versus* oat-growing in this locality on new land. The points obtained as the result of discussion, and outside sources as well, were strongly in favour of wheat, because this crop can be depended upon every year to give payable returns with proper cultivation, whereas the oat crop would only produce a good paying crop once in about five years. Of course members quite agreed that oats are very beneficial as a rotation crop for land cropped with wheat for a number of years, and subject to take-all, flag smut, &c. A good discussion followed on the question—Is it advisable and profitable to use fertilisers on the rich, heavy timbered land of this locality in seasons like the past one, with hot fiery winds setting in early in the spring months? A lot of damage, it was said, was bound to result, because without manure the crops were burnt up and badly blighted on this class of land; whereas cold clayey lands were little affected, and land which had been cropped a number of years was greatly benefited, and the resulting crop paid for the extra labour and expense. But it would be sound policy for farmers to experiment more on the newer lands before incurring much extra expense and labour by using much fertiliser on land that is already too rich in its natural state. Mr. Faulkner proposed a hearty vote of thanks, which was strongly supported by the chairman and members, to the secretary for the time and trouble taken in making the first meeting a very successful one from all points of view, giving members a good idea and insight into the conducting of bureau meetings generally.

Subjects for next meeting: a paper by Mr. J. Faulkner on some suitable topic; a paper by Mr. W. Grover on Gardening; and a few notes by the Secretary on Poultry and Egg Production.

The following paper was read by Mr. C. F. Pearce:—

Sheds for protecting Hay and Fodder Crops.

In preparing a few notes on this very vital question, affecting as it does the very best interests of the producers of this State and the best interests of the State generally, my fellow producers will admit what a fine thing it is to have on the farm a sufficient supply of fodder safely secured, and on hand at any time for carrying on the several occupations. In New South Wales, where the crops are subjected to heavy summer rains, the loss and delay in harvesting the hay crop is something appalling; besides, there is nothing more disheartening, after working the whole year trying to secure a plentiful supply of fodder for the several occupations of the farm, than to have the crop ruined or partially so in a few days, for the want of a more perfect and up-to-date system of protection. I have seen some of the finest hay-sheds which can be found in the southern hemisphere, notably at North Yanco, Sir Samuel McCaughey's property. Some people will say that there is plenty of money there to do anything well. That may be so, but it requires a man of much genius to carry out all that has been done at North Yanco in the short space of thirteen years. Most men with ten times the amount of money would not accomplish half as much, and my object in bringing this matter prominently before members is to set them thinking, and with the Bureau at work we can readily assist one another.

In the first place I am firmly of opinion it would be good sound policy for the State, through the Department of Agriculture, to offer a very substantial bonus to any of our manufacturers and men of mechanical genius, for the most effective and cheaply constructed hay-shed composed of steel and iron. A shed to slide up and down, say, to a height of from 30 to 40 feet, to be lowered on to the stack, would be preferable. Such a shed could be arranged on the winch principle, or with wire ropes and pulleys. This is only wanted for a roof cover in our climate; protection for the sides is not a serious matter. Stock can be kept away by using strong netting fixed to uprights, and for the weather sides almost anything will do to hang perpendicularly. In the very near future we shall have our own steel and iron works, when, I trust, something substantial and cheap will be made, which will not only advance the very best interests of our producers as a whole, but which will be the means of saving hundreds of thousands of pounds at present sent away to other States that have not half the productive areas we have here at our very doors. The State of Victoria is building silos for their producers

on the time-payment system, and it would be wise policy for our own State to follow their example by way of providing both sheds and silos, because, by providing an ample supply of fodder safely secured for any time of stress and emergency, hundreds of thousands of acres of more land could be cultivated, besides saving the lives of scores of thousands of stock of all classes in the dry seasons.

I have noted while travelling around the district several useful sheds for protecting fodder, but they are few and far between. In our locality, where there is such an abundance of really good pine timber available on most farms, more attention should be paid to this very vital question; and, if no time to build is available in the first few years of settlement, farmers should be careful not to waste any time when clearing, and should not neglect to lay in a stock for future use. The timber will keep good for the next ten or fifteen years, and can be used when time is available. Any time and money spent in this direction will be amply repaid. A lot can be done in saving fodder by a good sound system of thatching the stacks, and I trust some of our members will be able to give us a few good points and lessons in this direction.

EXPERIMENTS.

I planted 3 bushels of field peas at the end of August. The crop came up well, with the promise of a good yield, until the end of September, when dry, hot, windy conditions set in, and continued far into October, completely spoiling the chance of a payable crop. The blue variety was sown; if greys were sown I am sure the results would be better. This is a very useful and profitable crop for both feeding pigs and poultry. At the same time I planted a bushel of Ninety-day maize, mixed with half a bushel of cowpeas. Only a few plants of the cowpeas came up. The maize came on splendidly until the very trying weather set in; it was then badly scorched, but provided abundant feed, along with two small plots of sorghum, to feed eight poddy calves throughout the summer months. They thrived splendidly on it; the crop also provided good healthy food for both pigs and poultry. I planted one and a half bags of potatoes, and though the crop was on the light side, only about 3 inches of rain falling from the time of planting until maturing, enough was grown to meet the wants of my large family all through the summer months, when famine prices were obtainable in all markets for this class of foodstuff. The result was very satisfactory indeed, and speaks well for the producing capabilities of our district. We were also very successful with onions, cabbages, cauliflowers, and other vegetables. Large plots of water and pie melons, also pumpkins, were sown, and with the abundant rains received of late, the crop is all that could possibly be desired; after providing for the family, the surplus is used for both pigs and poultry, which makes very healthy food, and is much relished by them. I can strongly recommend every farmer to fence off a plot for this class of crop, which will produce something to his advantage, even in very dry seasons, with good thorough cultivation.

My tree-planting operations have been very successful indeed, and far exceeded all anticipations. Eighty-two fruit and ornamental trees were planted, and only three missed growing, and a good many have had to be lopped twice on account of too much growth. About 400 vines and cuttings were planted, mostly cuttings, and about 60 per cent. or more are doing fairly well.

Mr. Pearce's experience shows clearly that summer fodder crops can be grown fairly successfully in dry districts, such as Narrandera, if proper cultivation methods are employed.

Such crops as maize, sorghum, pumpkins, &c., are invaluable to farmers in such districts, and it will certainly pay to give some attention to this class of crop for consumption on the farm.

Orangeville.

A demonstration on clearing and subsoiling land with explosives was given by Mr. Burrows, of Dalgety & Co., Ltd., at the invitation of this branch on 28th February.

At the March meeting this demonstration formed the principal subject for discussion.

While the majority opinion was, that clearing dry stumps by this method was not economical for this district, the subsoiling with explosives was looked upon with more favour. It was decided to make a more complete experiment, which took place on 4th April in a 15-year old mandarin orchard, when about twenty members assisted, and sixteen trees were treated by placing one plug under each tree, one in between, and a line of charges every 10 feet each side of the row.

Four trees were then treated in a different manner, *i.e.*, four charges were placed around each tree at a distance of 6 feet from the trunk, but none were put under the tree.

In every case the charges were placed 2 feet deep. The experiments are being watched with great interest by members of the branch.

Penrose-Kareela.

The members of this branch are anxious to obtain some information regarding the camping-place of the flying-foxes in the Penrose district. Anyone familiar with the district having a knowledge of the haunts of this pest, is requested to communicate direct with Mr. L. Pieremont, Hon. Secretary, Agricultural Bureau, Penrose.

Quirindi.

Quirindi farmers have formed a branch of the Bureau. Mr. A. H. E. McDonald, Inspector of Agriculture, delivered a lecture on "Wheat Culture," and subsequently explained to those present the objects of the Bureau. The following gentlemen were elected office-bearers:—Chairman, Mr. G. D. Porter; Vice-Chairman, Mr. T. Ivey, senior; Secretary, Mr. H. A. D. Crossman; Treasurer, Mr. A. Pengilley.

Tallawang.

In answer to an inquiry with reference to blackberry eradication from members of the Tallawang branch, the Secretary has been advised that the best means for eradicating young blackberries is to spray with a solution of arsenite of soda (4 lb. to 10 gallons). Where dense growth exists it is advisable to slash the vine, and then apply the spray. The present is a most opportune time to spray, but it may be found necessary to make another application, say, in September.

ANSWERS TO CORRESPONDENTS.

(Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.)

PREVENTION OF RUST IN WHEAT.—"C.B.": There is no treatment for preventing rust. The selection of varieties that are either rust-resistant or rust-escaping is at present the only course advocated by the Department.—GEO. VALDER.

FATTENING PIGS WITHOUT SKIM MILK.—"C.B.": Pigs will grow and put on good weight on fodder crops alone, but they require topping up for bacon purposes. One of the most useful foods for this purpose is maize-meal mixed with skim milk. Pigs are often raised and fattened without the use of milk, however, by using such grains as barley, peas, or maize to top them up during the last month or six weeks of growth.—GEO. VALDER.

A RARE APPLE.—"A.J.M.": The apple which you submitted as from a tree that has apples on it practically throughout the year, including times when there are no leaves, is very much like the Sicoult Russet, which is not now propagated by nurserymen. To secure the same variety, it is only necessary to send budding wood to the nurseryman in the season, or grafting wood in July, and he would work the variety on to a Northern Spy stock, and therefore give the original variety true to name. The tree would have to stand in the nursery season.—J. G. R. BRYANT.

ALGERIAN OATS AND RAPE FOR HAY.—"G.S.A.": It is hardly likely that these crops, sown together and fed off with sheep, would make a satisfactory hay crop if allowed to grow again. The rape would make a second growth as well as the oats, and rape cannot be made into hay.—GEO. VALDER.

ORANGE BORERS.—"R.M.": The presence of these grubs will be first noticed by their castings falling like sawdust under the tree. A bent copper wire can be inserted and pushed down until the grub is injured, or an opening can be made above and a little kerosene squirted in. The wounds upon the bark should be covered with grafting wax. It would probably be worthwhile, where these beetles are plentiful, to spray or wash the trunk and branches with some distasteful wash, such as kerosene emulsion or weak carbolic.—W. J. ALLEN.

CURL-LEAF.—"C. and P.": The most effective treatment for this disease is to spray the trees with lime-sulphur solution just before the buds burst in the spring. All leaves showing signs of infection should be picked off and burnt.—W. J. ALLEN.

A GRASS IN THE PIG-RUN.—"A.D.": The specimen sent is *Solanum pseudo-capicum* (cherry weed). It is very common in gardens, and, like many others of the genus, is reputedly poisonous.—E. BREAKWELL.

TO DISSOLVE STRYCHNINE.—"W.A.B.": Strychnine will dissolve quite readily in any dilute acid. Vinegar, which is a weak solution of acetic acid, is probably the handiest vehicle.—F. B. GUTHRIE.

SPRAYING WITH ALUM.—"H.H.": I have never heard of alum being used as a spray, and have no experience of it. Its action would probably be similar to that of sulphate of iron, and it should not be used in stronger solution than the latter.—F. B. GUTHRIE.

A SMALL BLACK AND WHITE BEETLE ATTACKING VEGETABLES.—"V.W.": These are chrysomelid beetles, most of which are plant-eating, those attacking cabbages and turnips being known as "flea beetles." Arsenate of lead should kill them in the larval and perfect state, a poison spray on the food being the most effective treatment, for when a contact spray like kerosene emulsion is used they simply jump away. Clean up all the remains of the late crop before replanting.—W. W. FROGGATT.

Orchard Notes.

W. J. ALLEN.

MAY.

Get ready for Planting and Pruning.

THE month of June is a favourable time for planting out deciduous fruit trees, and it would be well if the land is not already prepared to put it in order with the least possible delay. The area to be planted should be cleared, well fenced, and worked to an even depth. Ascertain the varieties of fruits which find most favour on the markets, then select such kinds as will thrive best in your soil and climate. Lay out the orchard properly, giving the trees plenty of room, so that there will be a sufficient area from which they will draw moisture to keep them in good growing condition during dry years. After planting, leave the trees well worked around, and apply a little mulch if available. Do every part of the work thoroughly, and you will not be disappointed in the ultimate results. Lime is beneficial to soils which are sour.

From now until pruning is a slack time, and it is well to give the orchard a rest until that time. Stable manure may be carted in for weak trees. Drains, fences, gates, or any repairs necessary may be attended to.

Lemons and mandarins will soon be ready for picking.

Pruning may be commenced towards the end of the month.

Refilling Old Orchards.

Refills in deciduous orchards should be planted as early as possible.

Passion Fruit.

Keep the fruit picked up as it falls, as it is then in its best condition. Grade it nicely, and pack it in rows in the boxes. If growers are exporting any other fruit, it would be a good plan to send a few cases of passion fruit along in order to test their carrying quality, as, if we can successfully land this fruit on the markets of the Old World and get it well introduced there, there should be an unlimited demand for it. There are thousands of acres of land near the coast on which the plant does well, and where, with proper attention, it produces heavy crops of fruit annually. Unfortunately, the trial shipments we have made up to the present have not all turned out satisfactorily, but we hope in time that the difficulties may be overcome, and that we may yet create a demand for this delicious fruit.

Nursery Stock.

The wraps on all budded nursery stock may be removed at any time now.

Wherever it is necessary to enclose the orchard with wire-netting—and I am sorry to say that this is a precaution which cannot be overlooked in many parts of the State—it is best to use a good wide netting, with small mesh at the bottom, as it is wonderful through what a small mesh a young rabbit will get, as well as how high a fence he will scale. Therefore, if the orchardist wishes to preserve his trees from the attacks of these pests, he must see that the orchard is securely enclosed before planting.

Fruit Fly.

Be very particular to pick up all fallen and infected fruit. Kerosene traps are excellent means for catching the fly. Shallow tins are preferable to deep ones. Saucers may be used if tins are not available.

Department of Agriculture,
Sydney, 2nd May, 1913.

BULLS FOR SALE

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—St. Michael of Wollongbar : sire, Trequean Mike (2103); dam, Polly 2nd of Roque Balan (imp.); calved 21st August, 1911. Price, **£40.**

Polly 2nd of Roque Balan (imp.) yielded 4,157 lb. of milk, equal to 235 lb. of butter.

Earl of Bath: sire, Monsieur Beaucaire ; dam, Miss Jasmine; calved 10th December, 1911. Price, **£35.**

HOLSTEIN COWS FOR SALE.

WOLLONGBAR EXPERIMENT FARM.

Name.	Date of Birth.	Sire.	Dam.	Price.
				£
Lolkje Field (not in calf) ...	12 Nov., 1904 ...	Garfield	Lolkje	20
Marjorie (in calf)	5 Sept., 1906 .	Chairman	Margaretha ...	30
Fraulein Arama (not in calf)..	4 Feb., 1907 ...	The Hague ...	Dina's Douwe ...	25
Marigold (not in calf) ...	25 Feb., 1907 ...	The Hague .	Margosa	25
Maggie Hague (in calf) ...	28 Aug., 1907 ...	The Hague ...	Maggie Obbe ...	30

BULLS FOR SALE—*continued.*

AT BERRY EXPERIMENT FARM.

JERSEYS.—Ladas : sire, Berry Melbourne ; dam, Lally Optician ; calved 11th November, 1911 ; colour, whole fawn. Price, **30 guineas.**

Lally Optician is by Sir Jack from Bellona. Bellona was by Optician (imp.) from Pattibelle (192). Pattibelle (192) was by Lily's Boy (imp.) from Claribelle (imp.)

Sir Jack is by Omelette's Pride from Lady Tidy 3rd (imp.).

Omelette's Pride was by Lucy's Pride from Rum Omelette (imp.).

Lucy's Pride was by Melbourne (imp.) from Miss Lucy 3rd (imp.).

Lally Optician gave 4,177 lb. of milk on her second calf, testing 6·2 per cent., equal to 299 lb. of butter last season.

Bellona gave 4,362 lb. of milk, testing 5·9 per cent., equal to 304 lb. of butter.

Foxtail : sire, Xmas Fox (imp.) ; dam, Bellona ; calved 24th April, 1912 ; colour, whole fawn. Price, **20 guineas.**

(Bellona's breeding is shown above, also milk yield.)

Pattibelle, whilst not of much account as a milk producer, was a particularly high tester. Her dam, Claribelle (imp.), was Champion Jersey female at the Royal Melbourne Show, and Pattibelle as a yearling obtained first in her class and reserve champion to her mother.

GUERNSEYS.—Belfast : sire, King of the Roses (imp.) ; dam, Flaxy II ; calved 20th September, 1911 ; colour, lemon and white. Price, **40 guineas.**

Flaxy II is by Rose Prince (imp.) from Flaxy (imp.). Flaxy II's only record is 3,333 lb. of milk, testing 5 per cent. (in 1911), equal to 197 lb. of butter. Flaxy (imp.) in 37 weeks gave 6,443 lb. of milk, producing 334 lb. of butter.

Haymaker : sire, The Peacemaker ; dam, Hayes Muzette 7th (imp.) ; calved 5th January, 1912 ; colour, lemon and white. Price, **40 guineas.**

The Peacemaker is by Calm Prince from Rose Petersen.

Calm Prince is by Rose Prince (imp.) from Gentle (imp.).

Rose Petersen is by Peter (imp.) from Rose Petal. Rose Petal is by Rose Prince (imp.) from Saucy Sal (imp.).

Hayes Muzette 7th (imp) in 1911 yielded 5,620 lb. of milk, testing 4·6 per cent, equal to 304 lb. of butter.

AT COWRA EXPERIMENT FARM.

JERSEY.—Shakespeare : sire, Sir Pat ; dam, Leading Lady ; calved 13th January, 1912 ; colour, whole fawn. Price, **20 guineas.**

Leading Lady is by Berry Melbourne from Lady Tidy 4th.

Lady Tidy 4th was by Golden Lord from Lady Tidy 3rd (imp.).

Berry Melbourne is by Melbourne (imp.) from Rum Omelette (imp.).

Sir Pat is by Sir Jack from Pattibelle (192).

Leading Lady, on her first calf, yielded 3,346 lb. of milk, testing 6 per cent., equal to 237 lb. of butter. Lady Tidy 4th, on her first calf, gave 3,174 lb. of milk, testing 4·5 per cent., equal to 168 lb. of butter.

GEORGE VALDER, Acting Under Secretary.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till—
Irish Shorthorn.	Limerick Lad (imp.)	.....	.....	Berry	*
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (im.)	Wollongbar Farm	*
,, ...	Imperialist ...	Florio	Lady Nancy of Minembah.	,, ,,	*
,, ...	March Pansy ...	Earl March ...	Australian Pansy	Grafton Farm ...	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
,, ...	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	,, ,,	*
,, ...	Elaine's Heir ...	Thessalian II ...	Wagga Elaine	Yanco Farm ...	*
,, ...	Royal Blood ...	Berry Melbourne	Calceolus ...	,, ,,	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie ...	Berry Farm ...	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Wagga Farm ...	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Kyogle	22 Dec., 13.
,, ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	,, ...	5 Mar., '14.
,, ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Grafton Farm ...	†
,, ...	Prince Souvia ...	Vivid's Prince...	Souvenir(imp.)	Grafton ,, ...	†
,, ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Casino	22 June, '13.
,, ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '13.
,, ...	Sunshine ...	King of the Roses	Princess Vivid	Grafton Farm ...	*
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	Claudius (imp.)	Golden Star II..	Claudia's Pride(imp.).	Tweed River ...	18 Aug., '13.
,, ...	Trengwainton VillageFavourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
,, ...	Good-bye ...	Western Duke...	Souvenir (imp.)	Casino	28 May, '13.
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Tinonee	1 June, '14.
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (im.)	Bega	1 May, '14.
,, ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Lismore	†
,, ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel(imp.).	Murwillumbah ...	10 Nov., '13.
,, ...	Prince of Warren Wood (imp.).	Kingsmoor Governor (1952)	Quail (7051)	Frederickton ...	†
,, ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Macksville ...	14 June, '13.
,, ...	Rosehill (imp.)..	Northesk (2073)	Faultless Footsteps (6132)	Raymond Terrace	19 June, '13.
,, ...	Duke of Orleans	Godolphin Arthur (1664)	Flower of the Preel 3rd (imp.)	H.A. College, Richmond	*
Ayrshire ...	Jamie's Heir ...	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ...	*
,, ...	Orphan Boy ...	Songster of Greystanes.	Rosamond ...	Glen Innes Farm..	*
,, ...	Wyllieland ... Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A. College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin(imp.)	Bratha 4th ..	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

* **Available for service only at the Farm where stationed.** † Available for lease or for service at the Farm where stationed.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1913.

Society.	Secretary.	Date.
Kyogle P., A., and H. Society	... M. P. Dunlop	... May 7, 8
Nyngan and District P. and A. Association ...	... R. H. A. Lyne	... ,, 7, 8
Walgett A. Association	... W. Neal ...	... ,, 21, 22
Central Australian P. and A. Association (Bourke)...	— Brett ...	... ,, 22
N.S.W. Sheepbreeders' Association (Sydney)	... H. N. Bowden	... July 2, 3, 4, 5
Deniliquin P. and A. Society	... L. Harrison	... ,, 17, 18
Peak Hill P., A., and H. Association	... A. Yeo ...	... ,, 30, 31
Narrandera P. and A. Association	... W. T. Lynch	... Aug. 5, 6
Murrumbidgee P. and A. Association (Wagga)	... A. F. D. White	... ,, 19, 20, 21
Corowa P., A., and H. Society	.. John D. Fraser	... ,, 26, 27
Gunnedah P., A., and H. Association	... M. C. Tweedie	... ,, 26, 27, 28
Parkes P., A., and H. Association	... G. W. Seaborn	... ,, 27, 28
Ariah Park P., A., H., and I. Association ...	... J. N. Taylor	... Sept. 2, 3
Wellington P., A., and H. Society	... A. E. Rotton	... ,, 2, 3
Manildra P. and A. Association	... C. M. Podmore	... ,, 3
Germanton P., A., and H. Society	... J. S. Stewart	... ,, 3, 4
Junee A. Association	... T. C. Humphreys..	,, 3, 4
Young P. and A. Association	... T. H. Tester ..	,, 9, 10, 11
Albury and Border P., A., and H. Society ...	... W. I. Johnson	... ,, 9, 10, 11
Cootamundra A., P., H., and I. Association ...	... T. Williams	... ,, 16, 17
Cowra P., A., and H. Association	.. G. S. Fisher	... ,, 16, 17
Ganmain A. and P. Association	... J. F. Ashwood	... ,, 16, 17
Murrumburrah P., A., and I. Association ...	... J. A. Foley	... ,, 23, 24
Riverina P. and A. Society (Jerilderie) ...	... J. Kennedy	... ,, 24
Hay P. and A. Association	... G. S. Camden	... ,, 30, Oct. 1
Hillston P. and A. Association	... S. J. Gordon	... Oct. 8
Tweed River Agricultural Society (Murwillumbah)...	A. E. Budd	... Nov. 12, 13

1914.

Albion Park A., H., and I. Association ...	... M. A. Brown	... Jan. 14, 15
Kiama A. Association	... G. A. Somerville...	,, 23, 24, 26
Guyra P., A., and H. Society	... P. N. Stevenson...	Feb. 17, 18, 19
Inverell P. and A. Association	... J. McIlveen	... ,, 25, 26, 27
Uralla A. Association	... H. W. Vincent	... Mar. 3, 4, 5
Central New England P. & A. Association (Glen Innes)	George A. Priest...	,, 10, 11, 12
Armidale and New England P., A., and H. Assoc'n.	A. McArthur ...	,, 17, 18, 19, 20
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins	... April 1, 2, 3
Royal Agricultural Society (Sydney)	... H. M. Somer	... ,, 7–15
Northern Agricultural Association (Singleton)	... E. J. Dann	... April 29, 30, May 1.

STALLION PARADES FOR MAY.

Date.	Place.	Time.
Tuesday, May 6	Tocumwal	Noon.
,, ,, 6	Nyngan	2 p.m.
Wednesday, May 7	Berrigan	10 a.m.
Thursday, ,, 8	Deniliquin	11 ,,
,, ,, 8	Warren	2 p.m.
Friday, ,, 9	Jerilderie	2 ,,
Monday, ,, 12	Moree	10 a.m.
Wednesday, ,, 14	Hay	10 ,,
Thursday, ,, 15	Whitton	2 p.m.
Friday, ,, 16	Cobar	9 a.m.
Tuesday, ,, 20	Walgett	3 p.m.
Wednesday, ,, 21	Narrandera	2 ,,
Thursday, ,, 22	Wee Waa	10 a.m.
Friday, ,, 23	Coolamon	10 ,,
,, ,, 23	Narrabri	10 ,,
Monday, ,, 26	Urana	2 p.m.
Tuesday, ,, 27	Lockhart	2 ,,
Wednesday, ,, 28	Boggabri	10 a.m.
Thursday, ,, 29	Gunnedah	9·30 a.m.
,, ,, 29	The Rock	10 a.m.
Friday, ,, 30	Henty	10 ,,
,, ,, 30	Quirindi	9·30 a.m.
,, ,, 30	Murrurundi	2 p.m.

The Usefulness of the Frilled Lizard.

A correspondent from Attunga calls attention to the treatment accorded to the little frilled lizard. Every boy, apparently, thinks it his duty to torture the little creature and wipe him out. The other day a terrier having killed one, I opened it to see what it had been dining on, when I found its stomach contained dozens of grasshoppers. It evidently lived on nothing else but these and what appeared to be the leaves and buds of the "vervaine" or some similar herb.

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Agricultural Gazette of New South Wales.

Prevention of Bunt in Wheat.

EXPERIMENTS WITH FUNGICIDES AT COWRA EXPERIMENT FARM, 1911–12.

M. H. REYNOLDS, Manager.

THESE experiments are a continuation of the work done in previous years, and their objects may be briefly recapitulated as follows:—

(I) To what extent do certain fungicides destroy the spores of bunt on the seed grain, and so prevent the occurrence of the disease in the crop resulting from the planting of the treated grain?

(II) Have these fungicides an injurious effect upon the vitality and vigour of the treated grain?

III) Do these fungicides prevent reinfection to any extent?

(IV) In connection with the combined treatment with bluestone and limewater, is it detrimental to delay the immersion in limewater for some time after the draining following immersion in bluestone solution?

(V) In what proportion should salt be added to bluestone solutions, to obtain the best results from the combined treatment with bluestone and salt?

(VI) In the treatment with Fungusine, are the best results obtained from the use of the solution only, or is it also necessary to bring the insoluble portion into action by keeping it well mixed with the grain? [This portion of the experiment was discontinued in 1912, as it was found that the treatment with solution only was less effective than the treatment with both the soluble and insoluble portions of the Fungusine.]

(VII) Can the harmful effects of the bluestone solution upon the germination of the seed be counteracted by a supplementary immersion of the latter in water, without detracting from the efficiency of the treatment as a fungicide?

In 1912, the following were added to the previous experiments:—

(VIII) In the bluestone, and bluestone and lime treatments, is the efficiency as a fungicide improved, and is the treatment less harmful to the germination, if the percentage of bluestone is reduced and the period of immersion increased correspondingly?

Preparation of Materials.

The procedure adopted in dealing with the various plots was similar to that of previous years, and was as follows:—

The *Bluestone* (2 *per cent.*) *solution* was made by dissolving bluestone in water at the rate of 2 lb. of bluestone to 10 gallons of water.

The *Limewater* used was a thin milk of lime, and was made by slaking freshly burnt lime with water, using about 1 lb. of lime to 20 gallons of water.

The *Bluestone and Salt* (33 *per cent. solution*) was prepared by adding to a 2 per cent. solution of bluestone as much salt as the latter would absorb in two hours.

The *Bluestone and Salt* (18 *per cent.*) and *Bluestone and Salt* (2 *per cent.*) *solutions* were obtained by adding the requisite amounts of salt to measured quantities of 2 per cent. Bluestone solution.

The *Bordeaux Paste* was made up as directed by the vendors, viz., 2 parts to 500 parts of water.

The *Formalin Solution* was prepared by adding 1 part of commercial formalin (40 per cent.) to 400 parts of water.

Untreated Grain.—In order that only heavy grain ("sinkers") should be used in the plots to be sown with untreated seed, as well as on the plots treated with fungicides, the light grains were removed from the whole of the grain to be used in the experiment by pouring it gently into a vessel containing cold water, the light grains ("floaters"), chaff, &c., which remained on the surface being removed, and the remainder of the grain dried. This operation was done rapidly enough to prevent the grain becoming more than wetted on the surface. Grain not treated in any other way was regarded as untreated.

Grain treated with Formalin, Bluestone, Bluestone and Salt, or Bordeaux Paste.—The seed for each plot was placed in a suitable vessel and a solution of the required strength poured over it. The grain was then stirred, to ensure that every grain would be thoroughly wetted. After it had been immersed for five minutes, the solution was poured off and the seed dried in the sun or hung up to drain, as the nature of the experiment demanded.

Grain treated with Bluestone and Limewater.—The seed for each plot was immersed in a solution of bluestone for five minutes, and after the solution of bluestone had been poured off, limewater was poured on the seed and allowed to remain for about three minutes, the grain in the meantime being stirred about.

Grain treated with Fungusine.—Fungusine was used in two ways, viz., (*a*) "Solution only," in which the sediment was allowed to thoroughly settle, and then the remaining solution was drained off and used; (*b*) "As recommended by the proprietors," in which case the sediment was kept well stirred into the liquid. The material, which is in the form of a fine powder, was thoroughly mixed at the rate of 1 lb. to 1 gallon of water, after which it was poured over the prescribed quantity of grain, and the whole was stirred constantly to ensure thorough mixing.

Infected or Smutted Seed.—Seed of the different varieties was thoroughly infected with "smut" by being shaken about in a suitable vessel with a quantity of crushed-up bunt-balls, until the wheat grains were thoroughly covered with smut spores, and presented the appearance of having been rolled in soot.

Soil Conditions.

The soil where the experiment was located (1911 and 1912) is a chocolate loam, free working, and as uniform as possible. It was given a number of workings to bring it to a desirable condition, and to free it from foreign plants.

The rainfall for the month of June, 1911 (the seed was sown on 15th June), and the month of August, 1912 (the seed was sown on 22nd August) is appended:—

June, 1911, rainfall.			August, 1912, rainfall.		
8th	10	points.	2nd	15	points.
9th	19	,,	3rd	29	,,
10th	1	,,	4th	50	,,
11th	22	,,	5th	9	,,
17th	2	,,	6th	4	,,
19th	76	,,	7th	16	,,
20th	15	,,	13th	34	,,
21st	5	,,	14th	85	,,
			25th	25	,,
Total	150	,,	26th	46	,,
			27th	115	,,
			28th	36	,,
			29th	11	,,
			30th	3	,,
			Total	478	,,

It will be seen from this table that the soil was moist at seeding time. During 1912, the first half of the year was extremely dry, and the soil was worked up in an open condition, so that the unusual rains of August were not such as to cause waterlogging.

SECTION I.

Object:—To determine to what extent the fungicides tried destroy the spores of bunt on the seed grain, and so prevent the occurrence of smut in the crop.

The relative efficiency of the different methods was determined by counting the number of bunty plants produced after thoroughly infected seed had been treated according to the various methods under trial. For purposes of comparison, plots of infected, but untreated, seed were also sown.

The number of smutty plants was determined by an examination of the plants in the different plots, at a suitable time after they had flowered. Any plant containing one or more bunt balls was considered smutty, and counted as such. The results of this examination are given in Table I.

TABLE I.—1911.

Showing the relative efficiency of the various Fungicides in destroying Bunt Spores on the Seed Grain.
Seed infected, 15/6/11; treated, 15/6/11; planted, 16/6/11.

Method of Treatment after Infection.	No. of Seeds of each variety planted.	Bobs.					Comeback.					Federation.					Average.	
		No. of Plants.			Per cent.		No. of Plants.			Per cent.		No. of Plants.			Per cent.		Per cent.	
		Clean.	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.
Bluestone, 2%	500	361	3	364	99·17	·83	304	1	305	99 67	·33	305	3	308	99·02	·98	99·29	·71
,, 2 %, Limewater		423	22	445	95·05	4·95	417	2	419	99·52	·48	424	6	430	98·60	1·40	97·72	2·28
2 %, Water ...		442	1	443	99·77	·23	407	0	407	100·00	...	304	6	310	98·06	1·84	99·28	·69
, 2 %, Salt 2 % ..		408	0	408	100·00	...	340	0	340	100·00	...	342	0	342	100·00	...	100·00	...
,, 2 %, Salt 18 %...		323	1	324	99·69	·31	223	0	223	100·00	...	262	1	263	99·62	·38	99·77	·23
,, 2 %, Salt 33 %...		390	2	392	99·49	·51	369	0	369	100·00	...	392	0	392	100·00	...	99·83	·17
Bordeaux Paste		260	200	460	56·52	43·48	374	69	443	84·42	15·58	300	156	456	66·67	33·33	69·2	30·8
Fungusine (solution only)..		118	328	446	26·45	73·54	286	146	432	66·20	33 80	89	306	395	22·53	77·47	38·39	61·61
Fungusine (as recommended).		445	16	461	96·53	3·47	452	4	456	99·12	·88	440	14	454	94·51	5 49	96·72	3·28
Formalin, ¼ %		358	4	362	98·89	1·11	325	0	325	100·00	·00	306	3	309	99·03	97	99·31	·69
Lysol, 1 %		416	2	418	99·52	·48	382	18	400	95·50	4·50	366	15	381	96·06	3 94	97·03	2·97
,, 1½ %...		414	8	422	98·10	1·90	392	7	399	98·24	1·76	389	30	410	94·87	5·13	97·07	2 93
Scalecide (1 in 15) 5 minutes.		416	12	428	97·19	2·81	283	2	285	99·29	·71	409	3	412	99·27	·73	99·77	2·23
Clarke's Wheat Protector..		411	0	411	100·00	...	362	0	362	100 00	...	393	0	393	100·00	...	100·0	...
Corvusine		332	50	382	86·90	13·10	331	13	344	96·22	3·78	225	145	370	60·85	39·15	81·32	18·68
Untreated but infected ...		203*	3,079	3,282	6·19	93·81	465†	1,364	1,829	25 43	74·57	136†	1,629	1,765	7·71	92·29	13·11	86·89

* 3,750 seeds planted. † 2,000 seeds planted.

TABLE I.—1912.

Showing the relative efficiency of the various Fungicides in destroying the Bunt Spores on Seed Grain.
Seed infected, 9/8/12; treated 9 to 15/8/12; planted, 22/8/12.

Method of Treatment after Infection.	No. of Seeds of each Variety planted.	Bobs.					Comeback.					Federation.					Average.	
		No. of Plants.			Per cent.		No. of Plants.			Per cent.		No. of Plants.			Per cent.		Per cent.	
		Clean.	Bunty.	Total.	Clean.	Bunty	Clean.	Bunty.	Total	Clean.	Bunty.	Clean	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.
Bluestone, 2 %, 5 minutes...	400	311	...	311	100·	...	149	...	149	100·	...	124	...	124	100·	...	100·	...
,, ½ %, 10 ,, ...		306	...	306	100·	...	155	...	155	100·	...	282	...	282	100·	...	100·	...
,, ¼ %, 10 ,, ...		363	...	363	100·	...	348	...	348	100·	...	332	...	332	100·	...	100·	...
Water, 15 minutes; Bluestone, ¼ %, 10 minutes.		364	..	364	100·	...	372	...	372	100·	.	346	...	346	100·	...	100·	...
Bluestone, 2 %, 5 minutes; Limewater, 3 minutes.		349	...	349	100·	...	268	..	268	100·	...	271	...	271	100.	...	100·	...
Bluestone, 1½ %, 10 minutes; Limewater, 10 minutes.		355	...	355	100·	...	266	...	266	100·	...	288	...	288	100·	...	100·	...
Bluestone, 1 %, 10 minutes; Limewater, 10 minutes.		360	...	360	100·	...	331	...	331	100·	...	316	...	316	100·	...	100·	...
Bluestone, ½ %, 10 minutes; Limewater, 10 minutes.		360	...	360	100·	...	342	...	342	100·	...	361	...	361	100·	...	100·	...
Water, 15 minutes; Bluestone, ¼ %, 10 minutes; Limewater, 10 minutes.		370	...	370	100·	...	366	...	366	100·	...	372	...	372	100·	...	100·	...
Bluestone, 2 %, 5 minutes; Water, 3 minutes.		328	...	328	100·	...	273		273	100·	...	291	...	291	100·	...	100·	...
Bluestone, 2 %; and Salt, 2 %, 5 minutes.		288	...	288	100·	...	186	..	186	100·	...	208	...	208	100·	...	100.	...
Bluestone, 2 %; and Salt, 33 %, 5 minutes.		322	...	322	100·	...	258	...	258	100·	...	239	...	239	100·	...	100.	...
Bordeaux Paste		322	26	348	93·07	6·93	362	4	366	98·90	1·10	343	6	349	98·25	1·75	96·74	3·26
Fungusine		364	...	364	100·	...	370	2	372	99·46	0·54	363	1	364	99·72	0·28	99·73	0·27
Clarke's Wheat Protector...		258	...	258	100·	...	182	...	182	1 0	...	135	.	135	100·	.	100·	...
Lysol, 1½%, immersed 5 min.		331	1	332	99·70	0·30	329	...	329	100·	...	282	1	283	99·64	0·36	99·78	0·22
Scalecide (1 in 15), 5 min....		304	1	305	99·67	0·33	269	...	269	100·	...	228	1	229	99·56	0·44	99·74	0·26
Dry Copper Carbonate ...		354	2	356	99·44	0·56	360	...	360	100·	...	359	2	361	99·44	0·56	99·63	0·37
Flowers of Sulphur... ...		334	6	340	98·24	1·76	330	4	334	98·80	1·20	332	6	338	98·22	1·78	94·42	1·58
Solution of Lime and Sulphur.		349	13	362	93·64	6·36	381	1	382	99·73	0·27	351	2	353	99·43	0·57	97·60	2·40
Formalin (1 in 450)... ...		215	...	215	100·	...	217	...	217	100·	...	195	...	195	100·	...	100·	...
,, Vapour, ½ hour ...		259	94	353	73·37	26·63	353	1	354	99·72	0·28	275	55	330	83·33	16·67	85·47	14·53
,, ,, 1 ,, ...		230	53	283	81·27	18·73	322	18	340	94·71	5·29	251	43	294	88·30	11·70	88·09	11·91
Untreated, but infected ...	200	131	44	175	74·86	25·14	160	13	173	92·49	7·51	147	29	176	83·53	16·47	83·57	16·43

In this table the differences between the numbers of bunty plants are accepted as showing the relative efficiency of the different treatments.

The numbers of bunty plants found in the plots sown with infected but untreated seed show the bunt liability of the different varieties used in the experiments.

Concerning the 1912 results, it should be stated that stormy (rainy and windy) weather preceded the counting and checking work of the matured ears, flattening portions of the crop. There is, therefore, a possibility of the count not being as correct as it would be under other conditions.

The result indicates that in 1912 the wheat was less bunt-liable than in 1911.

SECTION II.

Object:—To determine whether certain fungicides used for the prevention of bunt have an injurious effect upon the germination of the seed grain.

This trial was conducted with three varieties as heretofore; the seed being treated at the same time, dried in the sun, and sown the same day.

In Table II will be found the results.

Considering the fungicides in general use, it is apparent from these two years' results, that treatment with a 2 per cent. solution of bluestone, without subsequent dipping in either limewater or fresh water, is very injurious to germination.

Bluestone and salt solution is likewise injurious.

Formalin in the proportions usually used by farmers (1 in 400) is also destructive of a large percentage of grain.

The bluestone and limewater treatment proved satisfactory in 1911, and in comparison with the other fungicides tested in 1912, is also satisfactory.

Fungusine had the minimum effect on the germination average for the two years.

Immersing the wheat in water for fifteen minutes prior to placing it in ¼ per cent. solution of bluestone for ten minutes, gave high germination in 1912 (the first year tried), with only 9·58 per cent. of grain destroyed.

Considering the two years, the method whereby the grain is immersed in fresh water after bluestoning is not satisfactory, although the effects of bluestone upon germination are slightly reduced.

SECTION III.

Object:—To determine whether any of the fungicides used prevent reinfection by bunt of the seed treated by them.

Seed of the three varieties was treated according to the different methods under trial, and after being sun-dried, were infected with bunt. This was carried out by crushing bunt balls, and mixing them through the grain until the wheat grains were covered with "smut." The seed so infected was sown shortly after.

The results are shown in Table III.

The 1911 results indicate the striking efficacy of any of the preparations containing bluestone in preventing reinfection.

TABLE II.—1911.

Showing the Number of Seeds which, after treatment with the various Fungicides, germinated at stated periods during the trial; also the Percentage of Seeds apparently killed by the treatment. Seed planted, 27/6/11.

Treatment.	No. of Seeds planted of each.	Bobs.					Comeback.					Federation.					Average.	
		No. of Plants on—			Percentage of Seed germinated.	Percentage of Seeds killed.	No. of Plants on—			Percentage of Seed germinated.	Percentage of Seed killed.	No. of Plants on—			Percentage of Seed germinated.	Percentage of Seed killed.	Percentage of Seed germinated.	Percentage of Seed killed.
		21/7/11	28/7/11	22/8/11			21/7/11	28/7/11	22/8/11			21/7/11	28/7/11	22/8/11				
Bluestone, 2 %	500	160	281	368	73·6	26·4	68	180	305	61·	39·0	115	251	313	62·6	37.4	65·73	34.27
,, 2 %, limewater .		353	433	456	91·2	8·8	283	395	420	84·	16·0	330	432	440	88·0	12·0	87·73	12·27
,, 2 %, water ...		324	427	447	89·4	10·6	199	350	416	83·	16·8	319	417	427	85·4	14·6	86·00	14·00
,, 2 %, salt, 2% ...		230	347	403	80·6	19·4	121	234	339	67·	32·2	120	244	348	69·6	30·4	72·67	27·33
,, 2 %, salt, 18 % ..		260	306	330	66·0	34·0	120	183	229	45·	54·2	177	241	274	54·8	45·2	55·53	44·47
,, 2 %, salt, 33 % ..		310	374	395	79·0	21·0	189	340	378	75·	24·4	258	369	402	80·4	19·6	78·33	21·67
Bordeaux Paste		425	463	468	93·6	6·4	419	444	448	89·	10·4	433	463	465	93·0	7·0	92·07	7·93
Fungusine (*a*)...		420	451	455	91·0	9·0	402	440	436	87·2	12·8	371	401	404	80·8	19·2	86·33	13·67
,, (*b*)...		425	462	472	94·4	5·6	413	450	458	91·6	8·4	413	454	457	91·4	8·6	92·47	7·53
Formalin, ¼ %		164	309	364	72·8	27·2	130	289	331	66·2	33·8	146	293	321	64·2	35·8	67·73	32·27
Lysol, 1 %		323	409	424	84·8	15·2	333	398	400	80·0	20·0	300	401	393	78·6	21·4	81·13	18·87
,, 1½ %		359	417	432	86·4	13·6	301	387	403	80·6	19·4	339	429	437	87·4	12·6	84·80	15·20
Scalecide (1 in 15)		265	410	437	87·4	12·6	175	262	282	56·4	43·6	317	410	422	84·4	15·6	76·07	23·93
Clarke's Wheat Protector ...		265	398	420	84·0	16·0	192	330	377	75·4	24·6	274	358	401	80·2	19·8	79·87	20·13
Corvusine		263	375	387	77·4	22·6	277	340	353	70·6	29·4	312	378	380	76·0	24·0	74·67	25·13

Table II.—1912.

Showing the Number of Seeds which, after treatment with the various Fungicides, germinated at stated periods during the trial; also the Percentage of Seeds which were apparently killed by the treatment. Seed planted, 28/8/12.

Treatment.	No. of Seeds planted of each.	Bobs.					Comeback.					Federation.					Average.	
		No. of Plants on—			Percentage of Seed germinated.	Percentage of Seed killed.	No. of Plants on—			Percentage of Seed germinated.	Percentage of Seed killed.	No. of Plants on—			Percentage of Seed germinated.	Percentage of Seed killed.	Percentage of Seed germinated.	Percentage of Seed killed.
		17/9/12	24/9/12	8/10/12			17/9/12	24/9/12	8/10/12			17/9/12	24/9/12	8/10/12				
Bluestone, 2 %, 5 minutes ...	400	298	301	311	77·35	22·25	134	146	155	33·75	66·25	136	114	127	34·00	66·00	48·50	51·50
,, ½ %, 10 ,, ...		172	294	306	76·50	23·50	263	270	263	67·50	32·50	271	282	282	70·50	29·50	71·50	28·50
,, ¼ %, 10 ,, ...		355	365	363	91·25	8·75	338	348	348	87·00	13·00	337	333	332	84·25	15·75	87·50	12·50
Water, 15 minutes; Bluestone, ¼ %, 10 minutes.		367	361	364	91·75	8·25	372	368	372	93·00	7·00	346	346	346	86·50	13·50	90·42	9·58
Bluestone, 2 %, 5 minutes; Limewater, 3 minutes.		346	350	349	87·50	12·50	262	270	268	67·50	32·50	266	272	271	68·00	32·00	74 33	25·67
Bluestone, 1½ %, 10 minutes; Limewater, 10 minutes.		350	356	355	89·00	11·00	257	264	266	66·50	33·50	290	298	289	74·50	25·50	76·67	23·33
Bluestone, 1 %, 10 minutes Limewater, 10 minutes.		361	358	360	90·25	9·75	329	324	331	82·75	17·25	314	316	316	79·00	21·00	84·00	16·00
Bluestone, ½ %, 10 minutes; Limewater, 10 minutes.		368	360	360	92 00	8·00	343	345	342	86·25	13·75	358	369	361	90·25	9·75	85·74	14·25
Water, 15 min.; Bluestone, ¼ %, 10 min.; Limewater, 10 min.		365	362	370	92·50	7·50	369	366	366	92·25	7·75	376	375	372	94·00	6·00	92·92	7·08
Bluestone, 2 %, 5 minutes; Water, 3 minutes.		327	323	328	76·50	23·50	240	258	273	68·25	31·75	283	284	291	72·75	27·25	57·50	42·50
Bluestone, 2 %, and Salt, 2 %, 5 minutes.		274	288	288	74·00	26·00	169	175	186	46·50	53·50	187	208	208	52·00	48·00	57·50	42·50
Bluestone, 2 %, and Salt, 33 %, 5 minutes.		321	320	322	80·50	19·50	253	251	258	64·50	35·50	240	235	239	60·00	40·00	68·33	31·67
Bordeaux Paste		349	355	348	88·75	11·25	370	365	366	92·50	7·50	347	349	349	87·25	12·75	89·50	10·50
Fungusine		367	363	364	91·5	8·50	350	374	372	93·50	6·50	374	364	364	93·50	6·50	92·83	7·17
Clarke's Wheat Protector ...		239	261	258	65·25	34·75	170	182	182	45·50	54·50	134	140	135	35·00	65·00	48·58	51·42
Lysol, 1½ %		307	324	332	83·00	17·00	323	329	329	82·25	17·75	283	285	282	71·25	28·75	78·83	21·17
Scalecide (1 in 15), 5 minutes		307	309	305	77·25	22·75	272	257	269	68·00	32·00	227	224	228	57·00	43 00	67·42	32·58
Dry Copper Carbonate ...		358	356	356	89·50	10·50	358	360	360	90 00	10·00	367	359	361	91·75	8 25	90·42	9·58
Flowers of Sulphur		352	338	340	88·00	12·00	334	336	334	84·00	16·00	337	339	338	84·50	15·50	85 50	14·5
Solution of Lime and Sulphur		361	362	362	90·50	9·50	363	382	382	95·50	4·50	360	363	353	90·75	9·25	92·25	7·15
Formalin (1 in 450)		213	215	215	53·75	46·25	228	191	217	57·00	43·00	179	195	195	48·75	51·25	53·17	46·83
Formalin Vapour, ½ hour ...		346	345	343	86·50	13·50	354	354	354	88·50	11·50	322	328	330	83·00	17·00	86·00	14·00
,, ,, 1 ,, ...		284	283	283	71·00	29·00	343	337	340	85·75	14·25	271	269	294	73·50	26·50	76·75	23·25

TABLE III.—1911.

Showing the extent to which each of the Fungicides prevents Reinfection after Treatment.

Seed treated, 15/6/11; sown, 16/6/11.

Treatment.	No of Seeds of each Variety planted.	Bobs.					Comeback.					Federation.					Average.				
		No. of Plants.			Per cent.		No. of Plants.			Per cent.		No. of Plants.			Per cent.		No. of Plants.			Per cent.	
		Clean.	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.	Total	Clean.	Bunty.
Bluestone, 2 %	500	319	29	378	92·33	7·67	258	5	263	98·09	1·91	296	22	318	93·08	6·92	303·00	18·67	321·67	94·83	5·17
,, 2 %; Limewater		361	85	446	80·94	19·06	353	13	366	96·44	3·56	356	77	433	82·22	17·76	356·67	58·33	415·00	85·94	14·06
,, 2 %; Water...		356	71	427	83·37	16·63	283	5	288	98·26	1·74	390	43	433	90·07	9·93	346·33	39·67	386·00	89·72	10·28
,, 2 %; Salt, 2 %		351	41	392	89·54	10·46	253	7	260	97·31	2 69	345	17	362	95·30	4·70	319·67	21·67	341·34	93·65	6·35
,, 2 %; Salt, 18 %		316	19	335	94·33	5·67	196	7	203	96·55	3·45	228	18	246	92·27	7·73	246·67	14·67	261·34	94·38	5·62
,, 2 %; Salt, 33 %		327	27	354	92·49	7·51	194	5	199	97·48	2·52	294	28	322	91·30	8·70	271·67	16·67	288·34	94·22	5·78
Bordeaux Paste		167	296	463	36·07	63·93	303	152	455	66·59	33·41	184	264	448	41·07	58·93	218·0	237·30	455·3	47·47	52·53
Fungusine Solution only		20	425	445	4·50	95·50	180	250	430	41·86	58·14	53	390	443	11·96	88·04	84·33	335·40	439 33	19·2	80·8
Fungusine as recommended		209	251	460	45·56	54·44	342	111	453	75·49	24·51	209	231	440	47·50	52·50	253·33	197·67	457·00	56·17	43·83
Formalin, ¼ %		37	352	389	9·51	90·49	185	217	402	46·02	53·98	53	341	394	13·45	86·55	91·67	303·33	395·00	23·21	76·79
Lysol, 1 %...		29	409	438	6·62	93·38	109	319	428	25·47	74·53	43	370	413	10·41	89·59	60·33	366·00	426·33	14·15	85·85
Lysol, 1½ %		40	400	440	9·09	90·91	155	269	424	36·55	63·45	48	357	405	11·85	88·15	81·00	342·00	423·00	19·15	80·85
Scalecide		122	253	375	32·54	67·46	202	142	344	58·71	41·29	177	216	303	45 04	54·96	167·00	203·67	370·67	45·1	54·90
Clarke's Wheat Protector		274	116	390	70·02	29·98	309	14	323	95·66	4·34	339	57	396	85·60	14·40	307·33	62·33	369·66	83·14	16·86
Corvusine		249	133	382	65·18	34·82	348	41	389	89·46	10·54	158	231	389	40·62	59·38	285·00	138·33	423·33	65·09	34·91

TABLE III.—1912.

Showing the extent to which each of the Fungicides prevents Reinfection after Treatment.
Seed treated, 14/8/12; infected, 15/8/12; planted, 22/8/12.

Treatment.	No of Seeds of each planted.	Bobs.					Comeback.					Federation.					Average.				
		No. of Plants.			Per cent.		No. of Plants.			Per cent.		No. of Plants.			Per cent.		No. of Plants.			Per cent.	
		Clean.	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.	Total.	Clean.	Bunty.	Clean.	Bunty.	Total.	Clean.	Bunty.
Bluestone, 2 %, 5 minutes	400	307	7	313	97·76	2·24	207	2	209	99·04	0·96	153	61	214	71·52	28·48	222·0	23·33	245·33	89·44	10·56
,, ½ %, 10 minutes		340	18	358	94·97	5·03	199	0	199	100	...	325	6	331	98·19	1·81	288·00	8·00	296·00	97·72	2·28
,, ¼ %, 10 minutes		331	11	342	96·78	3·22	284	4	288	98·61	1·39	325	7	332	97·59	2·41	313·33	7·33	320·67	97·66	2·34
Water, 15 minutes; Bluestone, ¼ %, 10 minutes.		285	25	310	91·94	8·06	281	3	284	98·94	1·06	203	21	224	90·62	9·38	256·33	16·33	272·67	93·83	6·17
Bluestone, 2 %, 5 minutes; Limewater, 3 minutes.		339	27	366	92·62	7·38	337	2	339	99·41	·59	300	16	316	94·95	5·05	225·33	15·00	340·33	95·66	4·34
Bluestone, 1½ %, 10 minutes; Limewater, 10 minutes.		338	30	368	91·85	8·15	345	1	346	99·68	0·32	344	24	368	93·48	6·52	342·33	15·00	357·33	95·00	5·00
Bluestone, 1%, 10 minutes; Limewater, 10 minutes.		353	14	367	95·37	4·63	350	9	359	97·49	2·56	349	20	369	94·58	5·42	350·67	14·33	365	95·81	4·19
Bluestone, ½%, 10 minutes; Limewater, 10 minutes.		329	25	354	92·94	7·06	356	12	368	96·74	3·26	329	25	354	92·93	7·07	338·0	20·67	358·67	94·20	5·80
Water, 15 minutes; Bluestone, ¼ %, 10 minutes; Limewater, 10 minutes.		326	33	359	90·81	9·19	374	2	376	99·47	0·53	350	18	368	95·11	4·89	350·00	17·67	367·67	95·07	4 93
Bluestone, 2 %, 5 min.; Water, 3 min.		307	19	326	91·10	8·90	295	2	297	99·33	0·67	251	5	256	98·05	1·95	284·33	8·67	293·00	96·16	3·84
,, 2 %, 5 min.; Salt, 2 %, 5 min.		190	4	194	97·94	2·06	226	...	226	100	...	219	2	221	99·09	0 91	211·67	2·00	213·67	99·01	0·99
,, 2 %, 5 min.; Salt, 33%, 5 min.		276	3	279	98·92	1·08	256	1	257	99·61	0·39	242	1	243	99·59	0·41	258·00	1·67	259·67	99·37	0·63
Bordeaux Paste, 5 minutes		282	62	344	81·98	18·02	347	14	361	96·12	3·88	243	50	293	83·28	16·72	280·67	42·00	322·67	87·13	12·87
Fungusine		313	31	344	90·99	9·01	299	8	307	97·39	2·61	316	47	363	87·05	12·95	309·33	28·67	338·00	91·81	8·19
Clarke's Wheat Protector		285	22	307	92·83	8·17	249	5	254	98·03	1·97	192	5	197	97·46	2·54	242·00	7·33	249·33	96·11	3·89
Lysol, 1½ %, 5 minutes		256	55	311	82·31	17·69	287	18	305	94·09	5·91	249	55	304	81·91	18·09	264·33	42·67	307·00	86·10	13·90
Scalecide (1 in 15), 5 minutes		232	66	298	77·85	22·15	214	26	240	89·17	10·83	184	42	226	81·42	18·58	210·00	44·67	254·67	82·81	19·19
Dry Copper Carbonate		340	5	345	98·55	1·45	336	6	342	98·25	1·75	292	...	292	100	...	322·67	3·67	326·34	98·93	1·07
Flowers of Sulphur		314	45	359	87·46	12·54	329	27	356	92·42	7·58	314	36	350	89·73	10·27	319·00	36·00	355·00	89·87	10·13
Solution of Lime and Sulphur		306	65	371	81·94	18·06	339	13	352	96·31	3·69	334	28	362	92·26	7·74	326·33	35·33	361·66	90·17	9·83
Formalin (1 in 450), 5 minutes... ...		175	41	216	81·02	18·98	157	30	187	83·95	16·05	139	31	170	81·77	18·23	157·00	34·00	191·00	82·25	17·75
,, Vapour, ½-hour		275	63	338	81·36	18·64	335	15	350	95·71	4·29	240	36	276	86·96	13·04	283·33	38·00	321·33	88·01	11·99
,, ,, 1 hour		137	27	164	83·54	16·46	241	5	246	97·97	2·03	177	22	199	88·94	11·06	185·00	18·00	203·00	90·15	9·85

Immersing the grain in water after it has been bluestoned has the effect of increasing the susceptibility of the grain to attack by bunt—a result not noted in other years. With the exception of Clarke's Wheat Protector, the fungicides tried were deficient in preventing reinfection.

The 1912 results show that an all-round reduction in the prevalence of smut occurred, formalin and Scalecide being the least effective.

Average Results.

In a special table, marked Table A, is shown the method of preparing each of the fungicides tested, together with the number of years during which the test has been conducted, the percentage of bunty plants after each treatment, the effect of each upon the vitality of the grain, and the extent to which each treatment affords protection against the subsequent infection of the seeds. As bringing the results of four years' work together the table is instructive.

It will be seen from this that five fungicides tested in 1911, were omitted in 1912. The remainder of those tested in 1911 are included in the 1912 list.

Omitting, for the present, the results of fungicides tested one year only, the foregoing average results show how efficacious bluestone preparations are in preventing bunt in Sections I and II ; but bluestone treatment when not followed by limewater or water-dipping is very severe on germination, though not to the same extent as bluestone and salt.

Fungusine, although not so valuable as a bunt preventive, is nevertheless satisfactory in this regard. After reinfection it is much less valuable than bluestone, but its effect on the germination is much smaller than bluestone alone (a 2 per cent. solution), an actual saving of 29 per cent. of the grain by using Fungusine as against the bluestone 2 per cent. solution being shown.

Formalin (1 in 400) by the average results does not show up favourably in any of the three sections.

The method recommended by the Department (dipping in bluestone 2 per cent. solution for 5 minutes, then immersing in milk of lime for 3 minutes) gave superior results in two sections over Fungusine, but destroyed 10 per cent. more seed.

Clarke's Wheat Protector (a two-years' test) completely removed bunt from the crop. Although satisfactory, it is not equal to bluestone 2 per cent. in preventing reinfection, but it has less effect on germination.

Treating the grain with bluestone 2 per cent., and then immersion in water (three years' results), is a promising method, being superior all round to bluestone alone, and giving better results than bluestone 2 per cent. and limewater, except in effect on germination.

The striking result of the lysol test is the high percentage of bunty plants after reinfection ; in this regard it equals Fungusine solution only. The solution alone is not recommended by the proprietors. It should be noted how much more efficacious as a bunt preventive the 1½ per cent. lysol solution is over the 1 per cent. and ½ per cent. solutions. In considering the merits of the various fungicides, the saving of time where only one dipping operation is required must not be overlooked.

TABLE A.—Showing Method of Preparation of the Fungicides tested, and the Average Results obtained since the inception of the Experiment.

Fungicides tested in 1912.	Number of Years tested.	Period of Test.	Section I. Percentage Bunty Plants.	Section II. Percentage Germination.	Section III. Percentage Bunty Grain reinfected after Treatment.
Bluestone, 2 % solution, grain immersed 5 minutes. (2 lb. bluestone to 10 gallons water.)	4	1909 to 1912	0·85	61·9	9·93
Bluestone, ½ % solution, grain immersed 10 minutes. (½ lb. bluestone to 10 gallons water.)	1	1912	.....	71·5	2·28
Bluestone, ¼ % solution, grain immersed 10 minutes. (¼ lb. bluestone to 10 gallons water.)	1	1912	.....	87·5	2·34
Water immersion of grain, 15 minutes; then in ¼ % bluestone solution, 10 minutes...	1	1912	.....	90·42	6·17
Bluestone, 2 % solution, grain immersed 5 minutes; then immersed in lime-water 3 minutes. (The limewater used was a thin milk of lime, made by slaking freshly burnt lime in water, using about 1 lb. of lime to 20 gallons water.)	4	1909 to 1912	2·44	80·31	13·67
Bluestone, 1½ % solution, grain immersed 10 minutes; then immersed in limewater 10 minutes.	1	1912	.....	76·67	5·0
Bluestone, 1 % solution, grain immersed 10 minutes; then immersed in limewater 10 minutes.	1	1912	.....	84·0	4·19
Bluestone, ½ %, grain immersed 10 minutes: then immersed in limewater 10 minutes	1	1912	.....	85·74	5·8
Water immersion of grain 15 minutes; then immersed in bluestone, ¼ % solution, 10 minutes; then immersed in limewater 10 minutes.	1	1912	.....	92·92	4·93
Bluestone, 2 % solution, grain immersed 5 minutes; then immersed in water 3 minutes.	3	1910 to 1912	0·36	74·3	7·04
Bluestone, 2 % and salt 2 % solution, grain immersed 5 minutes...	3	1910 to 1912	.....	64·19	2 84
Bluestone, 2 % and salt 33 %, grain immersed 5 minutes ... ... (The solution of salt was obtained by adding the requisite amount of salt to measured quantities of the 2 % solution of bluestone.)	4	1909 to 1912	0·32	74·69	4·25

TABLE A.—Showing Method of Preparation of the Fungicides tested, and the Average Results obtained since the inception of the Experiment—*continued.*

Fungicides tested in 1912.	Number of Years tested.	Period of Test.	Section I. Percentage Bunty Plants.	Section II. Percentage Germination.	Section III. Percentage Bunty Grain reinfected after Treatment.
Bordeaux Paste, 1 % solution, used as directed by proprietors	3	1910 to 1912	11·52	88·79	23·93
Fungusine (solution as recommended by proprietors), grain immersed for 5 minutes	4	1909 to 1912	3·45	90·7	24·48
Clarke's Wheat Protector (solution as recommended by proprietors), grain immersed for 5 minutes.	2	1911 and 1912	.....	64·22	10·37
Lysol, 1½ % solution, grain immersed for 5 minutes	2	1911 and 1912	1·57	81·81	47·37
Scalecide (solution of 1 in 15), grain immersed for 5 minutes	3	1910 to 1912	9·86	73·83	33·73
Dry Copper Carbonate, grain mixed in dry copper carbonate	1	1912	0·37	90·42	1·07
Flowers of Sulphur, grain mixed in dry flowers of sulphur	1	1912	1·58	85·5	10·13
Solution of lime-sulphur, 2 % solution, grain immersed for 10 minutes... ... ... (The lime-sulphur solution was prepared as follows: Lime, unslaked, 4½ oz., sulphur 3 oz., water 90 oz. This was then diluted 2 in 100.)	1	1912	7·2	92·25	9·83
Formalin, 1 part in 450 water, grain immersed for 5 minutes	1	1912	.....	53·17	17·75
Formalin vapour, the grain fumigated for ½ hour	1	1912	14·53	86·	11·99
Formalin vapour, the grain fumigated for 1 hour	1	1912	11 91	76·75	9·85
Infected and untreated	4	1910 to 1912	55·42	.....	.....
Fungicides omitted in 1912, *but previously tested.*					
Formalin (1 in 400), grain immersed 5 minutes	3	1909 to 1911	6·66	69·77	58·06
Lysol, 1 % solution, grain immersed 5 minutes	2	1910 and 1911	7·83	81·46	57·17
Fungusine (solution only, sediment removed)	2	1910 and 1911	39·3	87·51	48·0
Lysol, ½ % solution, grain immersed 5 minutes	1	1910	24·9	85·6	37·8
Scalecide (1 in 25), grain immersed 5 minutes	1	1910	35·5	78 0	54·8
Corvusine, used as directed by proprietors	1	1911	18·68	74·67	34·91
Bluestone, 2 %, salt 187%, grain immersed 5 minutes	2	1910 and 1911	·115	55·53	3·41
Bordeaux Mixture	1	1909	14·7	87·2	44·9

SECTION IV.

Object.—To determine whether, in connection with the combined treatment with bluestone and limewater, it is detrimental in any way to delay the immersion of the grain in the limewater after the draining following treatment with bluestone, so as not to neutralise the effect of the limewater.

The 1911 results show an average reduction in germination of 5 per cent., although better germination is shown where the dipping in limewater is delayed one hour, than where it is delayed only half an hour.

The 1912 results show a much greater difference. Delaying the dipping in limewater for one hour reduced, on the average, the germination 24 per cent.

The 1911 results, Table V, show that prolonging the effect of the bluestone on the grain is questionable as a system to reduce smut prevalence. It may be concluded from these results that immersion in limewater immediately after draining, is equally as efficacious as delaying the operation.

The 1912 results point in the same direction.

SECTION V.

Object.—To ascertain the correct proportions in which salt should be added to the bluestone solution to obtain best results.

The results of three and four years' experiments will be found in Table A. These show that as a preventive of bunt the fungicide becomes less effective as the salt increases, and this is so where the seed is reinfected after treatment.

The germination results somewhat obscure the result, other than indicating how severe salt and bluestone combined is upon the germination of the seed.

SECTION VI.

Object.—To ascertain if the best results from Fungusine are obtained by using the solution only, or as recommended by the proprietors (the sediment well stirred up).

The results in Table A show clearly that the sediment should be used with the solution, and that the solution only is practically useless.

SECTION VII.

Object.—After treatment with bluestone, is a subsequent immersion in water desirable?

The results will be found in Table A. As before stated, the results to date imply that the immersion in water after bluestoning is beneficial.

SECTION VIII.

Object.—To ascertain the effect of reducing the percentage of bluestone and lengthening the periods of immersion.

The results can be seen by reference to Table A. From the one year's results, it appears that the reduction of the strength of the solution, and the increase of the period of immersion, gives superior results as a bunt preventive, less effect on germination, and greater efficiency in preventing reinfection.

TABLE IV.

Showing the effect on Germination of delaying treatment with Limewater after Bluestone. The 1911 planting was made on 28/6/11; the 1912 planting on 22/8/12.

Variety.	Immediately after Bluestone.					15 minutes after Bluestone.					30 minutes after Bluestone.					1 hour after Bluestone.				
	No. of Plants on—				Percentage of Plants on—	No. of Plants on—				Percentage of Plants on—	No. of Plants on—				Percentage of plants on—	No of Plants on—				Percentage of Plants on—
	21/7/11	28/7/11	4/8/11	22/8/11	22/8/11	21/7/11	28/7/11	4/8/11	22/8/11	22/8/11	21/7/11	28/7/11	4/8/11	22/8/11	22/8/11	21/7/11	28/7/11	4/8/11	22/8/11	22/8/11
1911.					%					%					%					%
Bobs	353	433	452	456	91·2	284	392	420	425	85·00	256	372	427	454	90·80	224	347	409	435	87·00
Comeback ...	283	395	405	420	84·00	153	340	361	398	79·60	131	273	325	390	78·00	120	274	309	377	75·40
Federation ...	330	432	439	440	88·00	231	397	418	431	86·20	146	302	356	381	76·20	157	322	392	421	84·20
Average ...	322	420	432	438·6	87·73	222·6	376·3	399·6	418	83·60	177·6	315·6	369·3	408·3	81·60	167	314·3	370	411	82·20
1912.	17/9/12	24/9/12	8/10/12		8/10/12	17/9/12	24/9/12	8/10/12		8/10/12	17/9/12	24/9/12	8/10/12		8/10/12	17/9/12	24/9/12	8/10/12		8/10/12
Bobs	346	350	350	...	87·50	317	315	322	...	80·50	300	295	298	...	74·50	246	253	252	...	63·00
Comeback ...	262	270	268	...	67·00	203	210	213	...	53·25	161	163	164	...	41·00	157	154	167	...	41·75
Federation ...	266	272	271	...	67·75	188	192	192	...	48·00	162	163	163	...	40·75	172	174	176	...	44·00
Average ...	291·3	297·3	296·3	...	74·08	236	239	242·3	...	60·60	207·6	207	208·3	...	52·08	191·7	193·7	198·3	...	49·60

500 seeds of each were sown in 1911; 400 in 1912.

TABLE V.

Showing the effect upon the efficiency of the Bluestone and Lime Treatment as a Bunt Preventive when the treatment with Limewater is delayed after Bluestoning the seed.

The 1911 planting was made on 26/6/11; the 1912 planting on 22/8/12.

Variety.	Immediately after Bluestone.				15 minutes after Bluestone.				30 minutes after Bluestone.				1 hour after Bluestone.			
	No. of Clean Plants.	Percentage of Clean Plants.	No. of Bunty Plants.	Percentage of Bunty Plants	No. of Clean Plants.	Percentage of Clean Plants.	No. of Bunty Plants.	Percentage of Bunty Plants.	No of Clean Plants.	Percentage of Clean Plants.	No. of Bunty Plants.	Percentage of Bunty Plants.	No. of Clean Plants.	Percentage of Clean Plants.	No. of Bunty Plants.	Percentage of Bunty Plants.
1911.																
Bobs	423	95·05	22	4·95	418	99·29	3	·71	429	98·62	6	1 38	420	98·82	5	1 18
Comeback	417	99·52	2	·48	389	98·98	4	1·02	378	99·47	2	·53	361	100·00	...	...
Federation	424	98·60	6	1·40	321	99·69	1	·31	359	99·72	1	·28	406	99·75	1	·25
Average	421·3	97·72	10	2·28	376	99·32	2·66	·68	385·33	99·27	3	·73	395·66	99 52	2	·48
1912.																
Bobs	349	100·00	...	...	321	99·69	1	·31	297	99·66	1	·34	252	100·00	...	...
Comeback	268	100·00	...	...	213	100·00	...	...	163	99·39	1	·61	167	100·00	...	...
Federation	271	100·00	...	...	192	100·00	...	...	163	100·00	...	...	176	100·00	...	...
Average	296	100·00	...	...	242	99·89	·33	·10	207·66	99·68	·66	·32	198·33	100·00	...	...

When to Cut Wheaten Hay.

Experiments at Roseworthy Agricultural College.

The Department of Agriculture of South Australia, in Bulletin No. 73, publishes the result of some experiments conducted at Roseworthy Agricultural College Farm during the season 1911–12, the object of which was the determination of the stage of development of the wheat crop most suitable to the making of hay.

A patch of King's White wheat, as even in quality as possible, was selected, and from it, at intervals of a week or thereabouts, seven successive cuts of hay were taken, starting at bloom time and ending up with the maturity of the grain. In each case the green crop was weighed as soon as cut, and put to dry in the usual way.

The following table shows the calculated yields of hay to the acre :—

Table showing Green and Dry Weights of Hay Cut at Various Stages of Growth.

When Cut.	Remarks.	Hay Yield per Acre. tons	cwt.	lb.	Loss of Moisture on Drying. per cent.
Sept. 22	Full bloom	2	12	2	61·22
,, 30	Grain just formed	3	5	94	59·15
Oct. 6	Grain full size ; milky	3	1	75	53·25
,, 15	Grain leaving milky stage ; most flag dry	3	8	73	49·41
,, 21	Grain just in dough state ; all flag dry	3	10	2	45·45
,, 28	Grain full and plump, but still soft ; straw pale gold	2	18	69	32·67
Nov. 4	Grain leaving dough stage, but not quite dry	2	13	109	17·76

Excepting the second sample (which for some reason appears to be abnormal), it will be noted that there is a progressive rise in yields from the cut made at full bloom to that made when the grain was frankly in the dough stage, and the flag quite dry. Subsequent cuts, however, showed a gradual decline in yields as the more or less complete ripening of the grain was approached. It will be noted, too, that the loss of weight on drying is far greater in the earlier than in the later stages of development. Whilst at full bloom the loss of weight on drying was represented by close on two-thirds of the green weight, the loss was less than one-fifth in the last cut, when the grain was practically ripe.

The yields from the various plots were subsequently subjected to analysis in the chemical laboratory, and the following provisional and tentative conclusions were offered :—

(1) Those who wish to secure the heaviest yields of wheaten hay to the acre must defer putting the binders into the field until the grain has fully reached the dough stage.

(2) Hay secured at this stage of maturity will prove dry and bleached, and carry with it a large proportion of grain. It will probably be more or less indigestible and, weight for weight, will not be the equal as a foodstuff of hay cut at earlier stages.

(3) Those who cut wheaten hay late with a view to securing heavy yields must carry out the work with the utmost expedition, since a tendency towards the shrinkage of yields will set in very soon after the maximum has been reached.

(4) The highest quality hay will be secured if cut when the grain is full size, but still in the milky stage.

(5) In hay cut at this stage, ears, culms, and flag will all prove equally nutritious, and if carefully cured will show a bright green colour and a small quantity of shrivelled grain.

(6) The usual commercial standards for quality in wheaten hay—colour and shrivelled grain—are amply justified.

Trials of Portuguese Onions.

In May, 1909, Mr. H. E. Pratten, of Mileewa, Ashfield, forwarded to Mr. J. Perry, then Minister of Agriculture, a packet of onion seed which he had specially selected while in Portugal the previous year. At the Minister's direction the seeds were divided, and small quantities sent to Hawkesbury Agricultural College and Bathurst and Glen Innes Experiment Farms for trial. At the last-mentioned farm the seed was a failure in the first season, and it was received too late at the other farms for trial that year.

Comparative trials were made in the following season at the College and Bathurst with very satisfactory results, the yields of the Portuguese onions being greater at Bathurst than those of the local varieties with which they were compared, while at the College the yields were well up to the average. All the varieties proved to be earlier, and produced considerably less top than the local onions. Unfortunately, the seed was lost at the College, owing to severe hot weather during the seeding period causing the seed tops to scald badly. Some seed was saved at Bathurst, and small quantities were sent to the College and several of the experiment farms for trial last year.

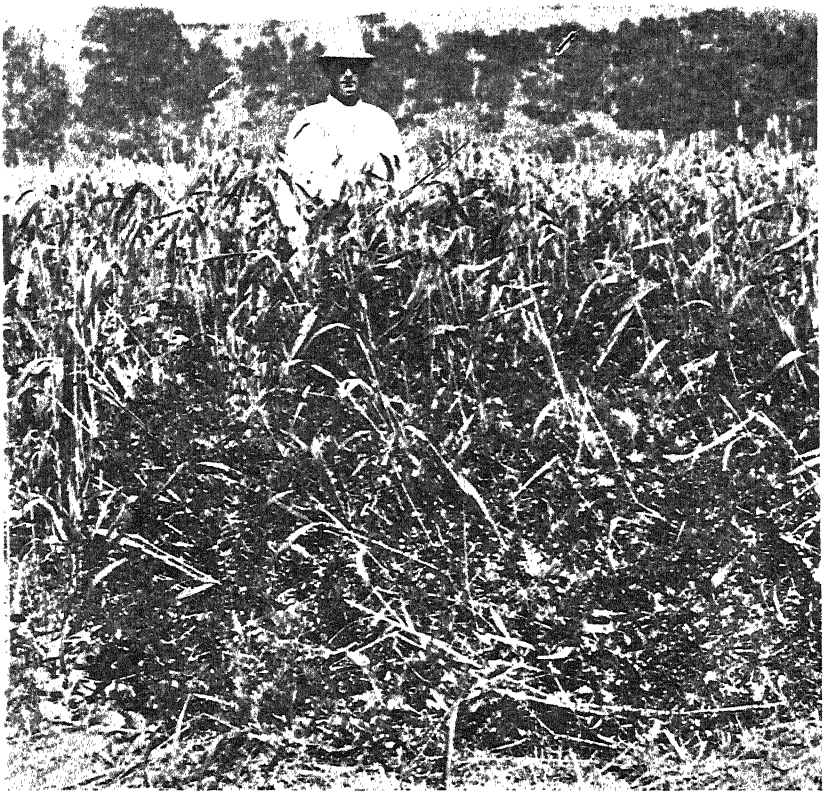
Reports to hand indicate that the variety is superior to other varieties usually grown in the State, and seed is again being saved for further trial. Mr. A. V. Donnan, Experimentalist at Hawkesbury Agricultural College, reported that "the onions are of good size and uniform shape (nearly spherical). They have brown and very thin skins, a nice mild flavour, taste comparatively sweet and juicy, and are altogether first-class quality onions."

The quantity of seed on hand is still very small, and the Department has none to spare for sale, but these particulars are given for public information.

Ensilage on the North Coast.

GEORGE MARKS, Inspector of Agriculture.

THE need for making adequate provision for stock in times of drought must be apparent to all who are in any degree familiar with our climatic conditions ; but it is to be regretted that, in many instances, the necessity for action does not appear to arise until heavy financial losses are incurred. With the



A good crop of Huguenot wheat and black vetches at Mr. W. Singleton's farm, Wondrook, Manning River.

advent of the dairying industry, and the consequent stocking up of holdings, the need for greater supervision of pastures and fodder generally was never more important than at present. The wonderful results obtained along the

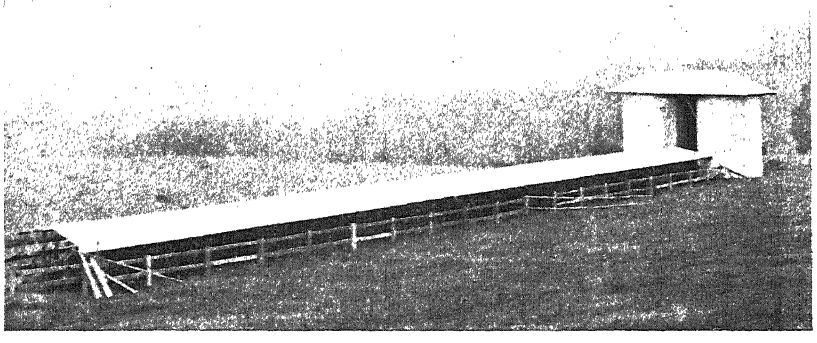
North Coast, and the general prosperity enjoyed by farmers and dairymen alike should not be an incentive to take things easy, or to neglect vital matters necessarily associated with the dairying industry. With such a magnificent grass as paspalum, and a wonderfully fertile soil, combined with



Huguenot wheat on Mr. F. Longworth's farm, Stewart's River.

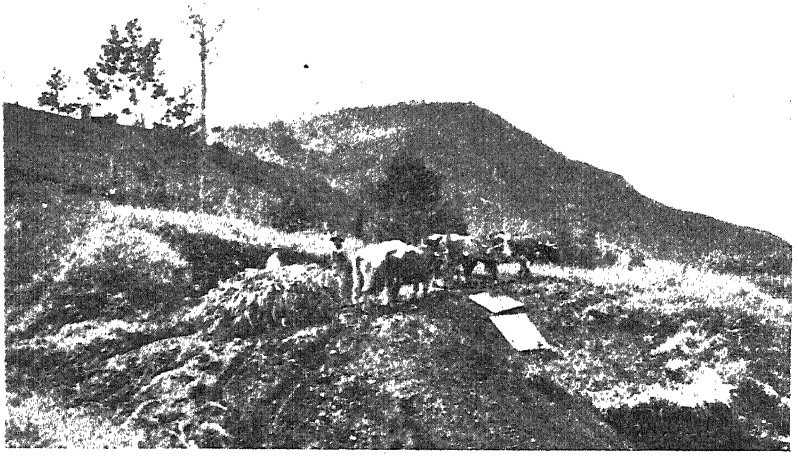
a liberal rainfall, the results that have been obtained so far could scarcely have been excelled in any part of the State; but a careful study, extending over a number of seasons, reveals the fact that while the pastures are capable of producing enormous amounts of succulent herbage, it is beyond all

reasonable expectation for them to maintain this supply throughout the whole year. It is against Nature's laws. Paspalum, as well as all other perennial grasses, must have a season of rest or inactivity, to enable the plants to recuperate after a heavy season's production, and thus it comes about that during certain periods there is a shortage of feed, particularly during the winter. Whatever may be said or thought to the contrary, one cannot get away from the fact that no natural pastures are able, under normal conditions, to maintain a continuous supply of succulent herbage that is so indispensable to the dairy cow. When abnormal conditions present themselves, these shortages become painfully apparent. It then becomes the duty of the farmer to safeguard himself against the inevitable loss. The North Coast lands are capable, under systematic cultivation, of producing enormous quantities of fodder which can be readily converted into hay or ensilage, and from a few acres sufficient maize, for example, could be grown which, converted into ensilage, would tide the average dairyman's herd over any ordinary drought.



Twin silos, and feeding and shelter sheds on Mr. W. Ness's farm, North Arm, Tweed River.

It is also very evident that better financial results would accrue if more attention were given to the question of feed, not only as regards quantity, but particularly quality. In the recently settled districts, where the work is necessarily mostly pioneering, and where much capital has had to be expended and hard work done before an income is forthcoming, there are many sections of work that have to be left undone. On the older farms, however, there is too much reliance placed upon the pastures, which in many instances fail to receive the attention that reasonable management would suggest. It thus follows that the returns from the dairy are largely controlled by the seasons. If there is the usual generous rainfall throughout the year, there is an abundance of grass and the herd responds; but if there should be a lengthened spell of dry weather, or an unusually hard winter, the feed speedily disappears, and the condition of the animals also falls



Drawing the maize to the hill silo, Mr. H. Cusbert's farm, The Channon.

away rapidly, with the consequent shortage in the dairy returns. The past two years have been fairly dry on the coast, and it was no uncommon sight to notice herds come through a severe winter in such low condition that half the summer passed before they could regain their normal condition. It can very readily be understood what such conditions entail. Overstocking, lack of proper subdivisions, failure to maintain and improve pastures, and total absence of adequate provision for the growing and conserving of fodder crops, are matters that are seriously affecting the returns of the average dairyman. As a matter of fact, the average season on the coast is too good



Bullocks being used to draw maize for ensilage, on Mr. H. Cusbert's farm, The Channon.

for the encouragement of proper farming methods, and few districts can boast of being able to dairy all the year round, winter and summer alike, on natural pastures alone. But if profitable returns are obtainable even under such conditions, what would be the result if an area of from 6 to 10 acres were given over to the plough for the express purpose of growing fodder crops. Of course, it must not be thought for one moment that good farming methods do not exist on the North Coast. There are indeed many whose systems could not very well be improved upon; but the number of these is comparatively small when the total number engaged in the dairying industry is taken into consideration. These notes are written solely with the hope that

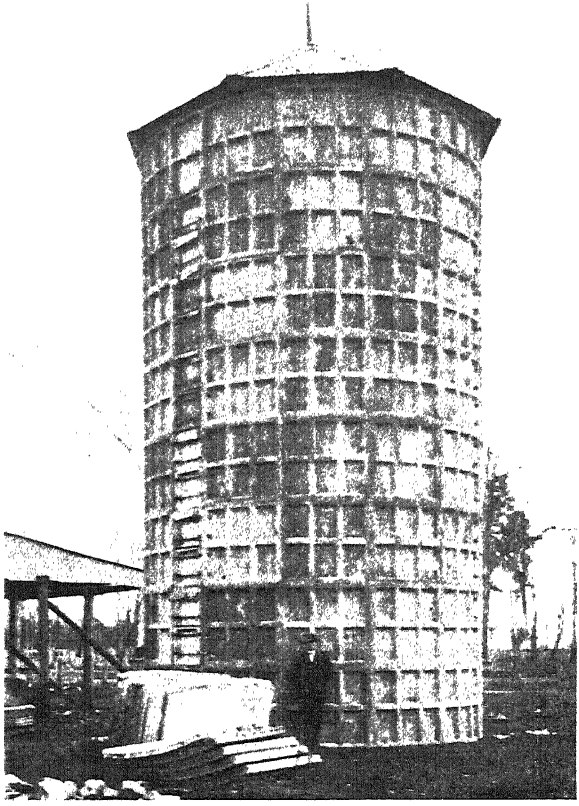


Yellow Dent maize for ensilage, grown under drought conditions on Mr. E. J. Roger's farm, Stewart Point Macleay River.

they may draw the attention of those who do not grow green fodder to supplement their pastures, and who do not conserve feed to tide over winter shortages or spells of drought, to the dangers and losses that must result should the district be visited by an unusually prolonged spell of dry weather. So far there has not been any such serious visitation; but other parts of the State have had their droughts, and it is only reasonable to suppose that the North Coast will not always be favoured with good seasons.

But apart from this, there is another aspect to the question, and that is the increased production obtainable from the average farm. Under cultivation larger quantities of fodder can be raised than from pastures alone, especially if such pastures have been laid down for a great number of years.

But through the efforts of the Department of Agriculture, farmers who have refrained from attempting to make ensilage, because they were not conversant with the subject, are able to get all the information necessary through the practical demonstrations that are given from time to time in the various centres, which have embraced practically the whole of the North Coast. These have covered the use of the tub, pit and stack, and the interest that has been taken would certainly convey the idea that ensilage will before many years be valued as much here as in other parts less favoured with good seasons.

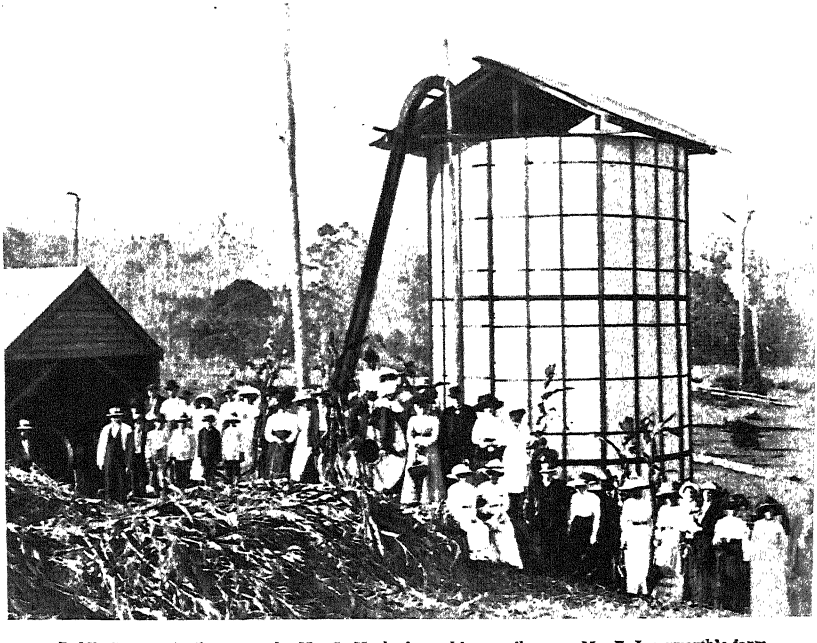


Reinforced concrete silo on Mr. E. O. Yeager's farm at Oaklands, Coraki. One of 11 on the estate.

The usual moist conditions prevailing during the summer and autumn months render the making of hay rather an uncertain and difficult undertaking, but such conditions do not in any way interfere with the making of ensilage. It is really shameful to view the hundreds of acres of paspalum going to waste every autumn because it grew faster than stock could eat it,



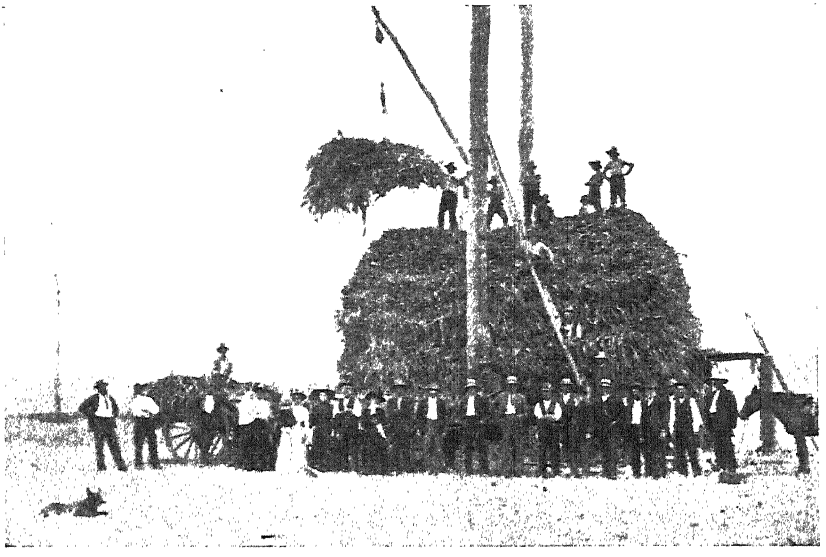
Public Demonstration given by Mr. G. Marks, Inspector of Agriculture, in making maize ensilage on Mr. E. J. Roger's farm, Stuart Point, Macleay River.



Public Demonstration given by Mr. G. Marks in making ensilage on Mr. F. Longworth's farm, Stewart's River.

where much could be utilised with maize in making ensilage, or even by itself where a large area was available on any single farm. Through the rank growth and mould, &c., the greater portion of this is entirely waste, to the detriment of the young grass underneath. On cleared farms the heavy succulent growth of herbage could be cut with the mowing machine and conserved. The pastures would be benefited by the operation, and there would be sufficient time for the young grass to grow to form a good sward for the winter.

Attempts have been made in several parts of the North Coast to make ensilage, with varying degrees of success. In many cases there have been absolute failures. These failures have been entirely due to ignorance on the



Public Demonstration in making stack ensilage with maize at Messrs. Mainey Bros.' farm, Mungay Flat, Upper Macleay, January, 1912. Over forty farmers present.

part of the farmer. He has not understood the principles which underlie the preservation of fodder in its green state, and reports have been accordingly circulated that in certain localities it is impossible to make ensilage. Upon investigating the methods adopted, the causes of such failures were readily found. Amongst these causes may be mentioned briefly the following:—Placing the material together in too dry and well matured a condition; using too small a quantity (10 to 20 or 25 tons); taking too long a time to finish the work; bad stacking; using pits practically water-tight, with no protection over them to keep out the heavy tropical rains; use of galvanized iron water-tanks, and even large casks, in which to store the fodder. The last-named might appear to be a bit far-fetched, but they have been actually used in a couple of districts, with of course resultant failures.

It is not proposed to deal with the various chemical, physical, and bacteriological changes that take place in the preservation of fodder as ensilage, as those matters have been fully dealt with already in the *Agricultural Gazette*. It is, however, necessary to impress upon farmers that while it is possible to make half a ton of hay, it is not possible to make equally small quantities of ensilage, and no attempt should be made unless the owner has upwards of at least 100 tons to work on. To those not familiar with the work this might appear to be a very large amount, but if it be properly packed or stacked it is surprising in how small a space the material can be placed.

For this district no crop will give such results as maize. There are few farms where 20 tons per acre could not be obtained, while on the richer soils over 30 tons are easily produced. The best results are obtained from the November and December plantings. The heat, with the tropical rains, always gives a heavy growth, and the crops come in during the autumn months when farm work is somewhat slack. In addition to maize, other crops, such as sorghums, cowpeas, pasture grasses, wheat, oats, millet, &c., can be utilised. But two things are essential for success: that there be a sufficient quantity of each, either by themselves or in combination, and that the crops be utilised when they have reached their maximum green growth and are still in a succulent condition.

In addition to the silos erected at the Government farms at Wollongbar and Grafton, there are several on the Tweed, Brunswick, and Richmond Rivers. One has been recently erected on the Lower Macleay, and two others are in existence on the Wallamba River and Dungog respectively. But speaking of the North Coast District as a whole, fodder conservation is somewhat neglected. Farmers are, however, beginning to realise that their pastures are not giving that prolific growth they formerly did when planted in the newly-cleared virgin soil, and that a departure from the old style of doing things must be made if the profits of dairying are to be maintained. To attain this result, the use of ensilage is strongly advocated. The cultivation of from 6 to 10 acres with suitable varieties of maize will enable sufficient material to be produced that, properly conserved, will carry the average milking herd over any ordinary winter or protracted spell of dry weather during spring or early summer, and without entailing a great deal of labour or time in its making. Should it not be required for this purpose during the season, it will keep, and may be held in reserve for future use, or it can be utilised for assisting pastures, and thus increase the production from a limited area. In view of the fact that good land is not easily procurable of recent years, more attention must be directed to the thorough management of farms already worked, and in this direction increased cultivation and the making of substantial quantities of ensilage annually are matters that must not be overlooked. Such a procedure will not only pay the individual, but will lead to an enormous increase in the present output of dairy produce of the North Coast.

Sheep on the North Coast.

J. W. MATHEWS, Sheep and Wool Expert.

[NOTE.—The following is an abbreviation of a report submitted after a recent tour of the North Coast districts.—ED.]

AFTER spending two days at the Gloucester Show, I preceeded north to Taree, and thence to Wingham.

Whilst the districts referred to are more adapted to cattle than to sheep, the latter could be very well introduced in many localities, not to the detriment, but rather to the improvement of the pasture lands on which cattle are grazed. Experience has proved that a continuous cropping of pasture land by cattle has a tendency to promote growth of the coarser, sourer, and less nutritious herbage. In the course of time, these replace those which are sweeter, shorter, and more succulent. Sheep feed on a greater variety of herbage than either cattle or horses. By their close bite they nip off the shoots of the shorter plants, causing their roots to spread, and to send forth a fresh and more vigorous growth, producing in time a sweeter, more permanent and abundant pasturage.

I do not consider that lamb-raising offers the same inducement as the production of a sheep more fully developed, and valuable for its wool and mutton. Experience has proved that for lamb-raising, natural pastures require to be supplemented by the growth of fodder crops. With this provision, lambs may be successfully raised for local consumption within certain localities in the districts mentioned, but the natural mating season of the sheep suitable for the district does not permit the lambs to be dropped at the right time for export. The mating season does not take place in coastal districts before March and April, and the earliest that lambs can be dropped is August or September. Allowing that they were six to seven months old when marketed, it would mean that they would not be available for sale or export before February or March.

After having seen the country in question, I have no reason to alter the opinion expressed in a former communication as to the best breed; in fact, I am still more impressed with the suitability of the Romney Marsh to these special local conditions. During the visit I examined several small flocks, which were not only thriving on the pastures, but retaining their health and vigour.

I was firmly convinced that the Romney Marsh strain, bred at the Hawkesbury Agricultural College, would be eminently suitable for these localities. For such pioneering duties as are necessary in the sweetening of natural pastures, hardiness of constitution must be considered before excellence of type. I consider that the type of Romney carrying a lighter fleece, exhibiting a strong bone and well-developed body, will succeed in

preference to heavier-woolled types. In other words, the development of the body should take precedence over the production of wool.

The necessity of adopting a regular and systematic form of treatment should be well kept in mind. In addition to the natural pastures, it would be well to supply the sheep with some extra feed in the form of rape or similar crops, which may be profitably grown. Besides this, sheep in coastal districts suffer from parasitic infestation, both internal and external. For the latter dipping is necessary, and this should be done about six weeks after the sheep are shorn. A small bath, not costly in construction, but in which the sheep could be immersed in a properly prepared dipping fluid for about a minute should be provided. On every pasture a liberal supply of salt in the form of a lick should be given to the sheep, and this should be served in weather-protected troughs. The lick should consist of 40 parts Liverpool salt, 1 part sulphate of iron, and 5 parts bone-meal or calcium phosphate.

Where the Romney Marsh breed is not obtainable, or proves too costly, the Romney cross-bred ewe is recommended as a substitute. With this ewe and succeeding generations, pure-bred Romney Marsh rams should be mated. In this way an acclimatised animal, and one approximating to the pure Romney breed, will be established. Where breeders cannot obtain Romney Marsh cross-bred ewes, the best method to adopt as an alternative would be to secure big-framed Merino ewes, and mate them with pure Romney rams with the object of raising the first and succeeding crosses. This, however, is not a practice that commends itself to the man possessing a knowledge of local conditions, as the Merino will not thrive in a humid climate and on wet pastures. Should he be able to arrange with another breeder, situated in a district more favourable to the Merino, to specially breed him a number of first-class Romney ewes, so much the better.

In all systems of mating, the question of in-breeding and consequent degeneration must be guarded against. Care should therefore be taken in each case to mate a ram unrelated to the ewes.

The Department can supply good Romney Marsh rams from the Hawkesbury Agricultural College, raised in a locality particularly suited to the breed, and as the pastures on which these types are raised are distinctly inferior to those generally found in the coastal areas, the breed would undoubtedly flourish if taken North.

Irrigation of Wheat for Hay.

An experiment was commenced last season at Yanco Experiment Farm to determine the number of times it is advisable to irrigate wheat which is being grown for hay, but owing to the season being wet, the results were unsatisfactory, and the Experiments Supervision Committee has decided that they should not be published. The experiment will be continued.

Cattle Records on Bodalla Estate.

M. A. O'CALLAGHAN, Dairy Expert.

THE records which are given on page 490 have been forwarded by Mr. Hutchison, manager of the Bodalla Estate, and the figures will prove of general interest to dairy-farmers throughout the State; more especially to those who know the character of the country on which the animals are depastured. Individual records of the cows have not been kept, and, therefore, it is not possible to say what any one cow produced during the year; but the total milk from each herd is weighed and tested regularly. The tests given represent the mixed milk of the herd.

Considering the large number of cows on each dairy, the records are exceedingly good. An average of 723 gallons per head for ninety-one Holstein cows is something worthy of the attention of all dairy-farmers. This breed of cattle has not received the attention that it deserves from many farmers whose lands and pastures are suitable for a large breed of dairy cow. The Holstein is looked upon in an unfavourable light by those who go in mainly for butter-making; but they should bear in mind that a cross-bred Holstein yields a milk as rich in butter-fat as does the cross-bred Shorthorn. The Holsteins mentioned, which have put up the best return, are not pedigreed cows; but, as only pure-bred bulls have been used in the herd for a number of years, there can be little else but Holstein blood in their veins.

The record of 566 gallons per cow from grade Shorthorns speaks well for that class of cow, and it will be remembered by those who have been to Bodalla that the rich flats on that estate are admirably suited for breeds such as the Shorthorn and the Holstein; and no doubt, for the purposes for which milk is produced (cheese-making), breeds like the Shorthorn, the Holstein, and the Ayrshire take foremost place.

At the head of the Holstein herd at Bodalla are two bulls bred on the Government Stud Farm at Berry, and it is doubtful if two better looking Holstein bulls could be met with anywhere in Australasia. The manager is particularly proud of them, and he will be lucky if he can get others equally good to take their place later on.

Supplying Lime to Cows.

THE simplest and best method that is within my knowledge for supplying lime to cattle is to use pulverised bone or bone-meal and mix it with a bran mash, or make a lick with bran and a little salt with which the bone-meal is mixed.

Care should be taken to see that the bone-meal is obtained from a reliable source, so that there will not be any possibility of introducing disease, and the farmer might take extra precaution by pouring boiling water on the bone-meal before use.—M. A. O'CALLAGHAN.

BODALLA ESTATE, N.S.W.—Annual Return, Year ended March 31, 1913.

Name of Farm.	Breed of Cows.	Cows Milking.	Cows Dry.	Total Cows.	Calf Milk.	House Milk and Sales.	Factory Milk.	Total Milk.	Average per Cow.	Butter Fat.	Average Duration of Lactation.
		No.	No.	No.	Gals.	Gals.	Gals.	Gals.	Gals.	Test.	Days.
Home Farm	Holstein	79	12	91	3,507	442	61,913	65,862	723	3·73	316
Comerang	Holstein grade, yellow and white.	112	19	131	1,713	674	83,121	85,508	652	3·71	312
Greenway	Holstein-Ayr. grade, black and white.	69	21	90	395	207	51,539	52,141	579	3·92	279
Central Bails	Shorthorn grade ...	90	25	115	502	4,284	60,304	65,090	566	3·84	285
Trunketabella... ..	Ayrshire	82	24	106	5,316	438	52,180	57,934	546	3·83	282
Blind Ned's	Holstein-Jersey grade	57	12	69	260	200	35,761	36,221	530	4·1	301
Greenwood Park ...	Shorthorn	88	30	118	3,949	409	57,794	62,152	526	3·82	272
Long Flat	Ayrshire grade ...	81	19	100	500	441	50,501	51,442	514	3·88	295
Cooper's Island ...	,, ,, ...	66	28	94	298	283	40,739	41,320	439	3·88	256
Bumbo...	Jersey grade	36	14	50	275	132	19,346	19,753	395	.....	262
Riverview	Culls from all farms ...	51	56	107	250	194	28,885	29,329	274	4·0	174
		811	260	1,071	16,965	7,704	542,083	566,752	529	.....	276

The Effect of Manuring upon Maize.

F. B. GUTHRIE AND A. A. RAMSAY.

THE results of some experiments carried out by Mr. W. A. Zuill, of Lower Southgate, in order to test the effect of manuring, especially potash manuring, upon the nature of the maize produced, are of sufficient interest to be recorded. One portion of the crop was left unmanured, a second treated with superphosphate at the rate of 4 cwt. per acre, and a third with 4 cwt. superphosphate and 1 cwt. sulphate of potash per acre.

Twelve stalks were taken from each plot as representing the average of the plot, and forwarded for examination. The weight of the whole plants and of the cobs from each lot of twelve stalks was as follow :—

TABLE I.—SHOWING WEIGHTS.

	Weight of Twelve Stalks (with Cobs and Leaves)	Number of Cobs in Twelve Stalks.	Total Weight of Cobs in Twelve Stalks.	Average Weight of Cobs.
	lb.		lb. oz.	oz.
No. 1—Unmanured	26	8	4 8¾	9·1
No. 2—Superphosphate only ...	32	10	6 2	9·8
No. 3—Superphosphate and sulphate of potash.	34	14	9 4	10·5

Assuming that the twelve stalks selected fairly represent the average of the plots, the results are fairly regular and striking. Manuring appears to have increased the weight of the individual plant (stalk, leaves, and cob), the number of cobs to the stalk, and the weight of the individual cobs. This increase is greatest in the sample manured with both superphosphate and potash.

The cobs from each sample of twelve stalks were then taken, and an average sample of the grain taken for analysis, with the result set out in the attached table. From this it will be seen that the grain from the manured plots is higher in albuminoids and carbohydrates than the other, and that the albuminoid ratio is narrower, providing a food of higher nutritive value.

TABLE II.—SHOWING ANALYSIS OF MAIZE KERNELS.

	1.	2.	3.
	per cent.	per cent.	per cent.
Moisture	68·40	62·14	60·31
Albuminoids	3 77	4·66	5·01
Ether extract	1·40	1·94	1·57
Fibre...	1·13	0·88	0·86
Ash	0·72	0·78	0·85
Nitrogen free extract	24·58	29·60	31·40
	100·00	100·00	100·00
Nutritive value	31·5	38·6	39·9
Albuminoid ratio	1 to 7·4	1 to 7·3	1 to 7·0

Calculated to Dry Substance.

	1.	2.	3.
	per cent.	per cent.	per cent.
Albuminoids	11·93	12·30	12·61
Ether extract	4·44	5·13	3·96
Fibre...	3·57	2·32	2·17
Ash	2 28	2·06	2·15
Nitrogen free extract	77·78	78·19	79·11
	100·00	100·00	100·00
Nutritive value	99·7	102·0	100·6
Albuminoid ratio	1 to 7·4	1 to 7·3	1 to 7·0

It would appear from the above figures that manuring, especially when carried out with a mixture of superphosphate and potash, increases the yield of maize, the number and weight of the individual cobs, and also the nutritive value of the grain.

It must, however, be said in warning that the above conclusions are only justified on the assumption that the samples taken truly represent the crop in each instance, and that it is an exceedingly difficult matter to take an average sample in the case of a crop like maize.

It must further be noted that the cobs were immature (the amount of water in mature grain being only about 12½ per cent.), consequently the figures only refer to the grain in this condition.

Field Experiments with Sugar-cane.

Duck Creek Farm.

J. G. McMILLAN, Manager, Wollongbar Experiment Farm.

The Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that these are the results of one year's trial only, and final conclusions therefore cannot be drawn.

This trial was commenced in 1910, the sets being planted in October. Standard varieties grown locally, also some new ones obtained from the Colonial Sugar Refining Company, were used. The paddock was about 5 acres in extent, the soil good loam, portion well drained, part low lying and badly drained. The cane was frequently cultivated and chipped to keep down weeds, and was cut in November, 1912. The general appearance of the crop where the ground was well drained was considered excellent, but where there was a lodgment of water the growth was in many cases practically nil. In taking samples to ascertain the yield per acre, it was considered only fair to take an average of the cane grown on the drier part It will be noticed that the one-year-old canes, such as Mahona, were allowed to grow to two years old. The yields per acre are appended.

A demonstration area of 5 acres was planted in October, 1911, on the best and highest piece of ground on the farm, it being well drained, About 1½ acres of this was harvested in November, 1912, and yielded 96 tons of commercial cane. This result and that on better drained ground of previous crops, compared with that suffering from bad drainage, shows how necessary it is for work to be done in this direction at the earliest opportunity. It is evident that demonstration areas of cane at Duck Creek will be highly remunerative.

The manager of the C.S.R. Company at Broadwater states, however, that our cane is rather below the average in sugar production, as compared with that of some of the farmers on the lower river. The table of analysis shows the difference in the various types of cane. The most remunerative would be Mahona, Malabar, New Guinea No. 14 and Mauritius Seedling.

TABLE showing weight and analysis of cane grown at Duck Creek Farm:—

Variety.	Yield per acre.	Percentage insol. assumed.	Cane Sugar.	Quotient.	P.O.C.S.
	T. c. q. lb.				
Malabar, No. 20	64 1 1 7	13	15·1	86·4	13·89
Mahona, No. 28	58 12 1 17	9	16·5	88·9	15·49
New Guinea, No. 14 (large) ...	53 19 0 8	15	15·9	88·8	14·90
Mauritius Seedling, 1900 ...	41 15 0 21	10	15·7	89·9	14·85
Demerara, 115	41 15 0 21	12	14·8	88·7	13·84
New Guinea, No. 23 (large) ...	38 2 2 7	13	17·5	90·8	16·58
Demerara, 1135	35 10 2 21	12	15·5	88·2	14·48
H.Q., 14	33 2 3 6	12	14·8	90·0	13·96
H.Q., 50	32 12 1 25	12	16·4	89·1	15·43
H.Q., 426	29 15 2 25	12	16·0	88·1	14·95
New Guinea, No. 16	27 19 2 14	13	17·1	89·5	16·13
Badilla, No. 4	23 17 1 0	10	17·7	91·9	16·91
Meaney's 1900 Seedling	19 15 3 13	12	15·9	88·4	14·81
H.Q., 68	19 9 0 7	12	17·5	90·7	16·62
H.Q., 51	17 13 1 1	12	16·1	91·1	15·32
H.Q., 42	9 6 3 0	12	17·1	89·8	16·13
New Guinea, No. 23 (small) ...	9 4 1 14	13	17·6	89·7	16·62
H.Q., 297	8 16 1 14	12	14·6	86·8	13·50
New Guinea, No. 14 (medium) ...	8 1 1 0	15	16·2	89·6	15·30

THE DIVINING ROD.

TRIAL AT COWRA EXPERIMENT FARM.

THE need for water on Cowra Experiment Farm led the Department of Agriculture in September, 1912, to arrange with a gentleman, who appeared to have met with success in western districts in locating water by means of the divining rod, to indicate the place at which boring might be conducted on the Farm and the depth at which water would probably be found. The report to the Department stated :—

After walking over the Farm with the divin ng rod I could only locate two sub-artesian underflows of importance and only one o real importance. The depths range from 132 feet. on the hill, and come within 46 feet of the surface in the bush paddock. The manager has pegged out the sites and taken a record of the depths. I am much impressed with this underflow. As far as agreed to I guarantee that water will be found at 46 feet at the spot pegged. I am of opinion from indications that at least 3,000 gallons will be obtained each twenty-four hours.

During October boring operations were carried out to a depth of 55 feet 8 inches, no water being found. After harvest work was resumed, and the manager carried the bore to a total depth of 70 feet, and there being no sign of water operations were discontinued.

Parturition of Farm Animals.

A. E. MASSY, M.R.C.V.S., Government Veterinary Surgeon.

PARTURITION means the expulsion of the fœtus, and is termed normal if the fœtus is born at full time without artificial aid; when, however, owing to a false position of the fœtus, or from certain conditions of the same, or from malformations, or organic obstructions in the mother, this does not occur, it is termed abnormal, and in these cases birth is never accomplished without assistance.

Anatomy of Generative Organs of Females.

The ovaries are situated in the abdominal cavity, and are suspended from the sub-lumbar region a little behind the kidneys.

The Fallopian tubes are two small flexuous canals about 10 inches long. They commence at the extremity of each horn of the uterus, and proceed more or less tortuously to one of the ovaries. They convey the spermatozoa of the male to the ovary in the first instance, and then take the impregnated ovum to the uterus or its horn, where development takes place.

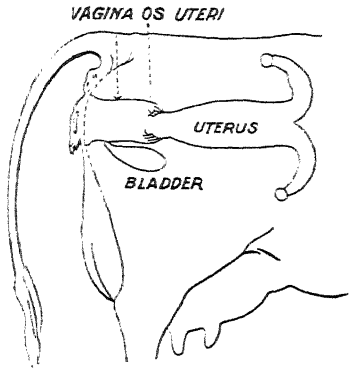


Fig. 1.—The Generative Organs of a Cow.

The uterus is a membranous sac composed of a body and two horns, situated in the abdominal cavity in the sub-lumbar region, at the entrance to the pelvis, and its posterior extremity opens by means of the os into the vagina.

As the period of parturition approaches, in normal cases, certain alterations take place, causing the uterus to contract and expel its contents; the blood which was being sent to the uterus for the nourishment of the fœtus is now diverted to the udder for the secretion of milk. Changes also occur between the membranes covering the fœtus and which are attached to the uterus; the exchange of materials between the uterus and fœtus is lessened, and the latter is now like a foreign body. Through the influence of the action of the nerves, the uterus is caused to contract and the young is expelled. We, however, never find two births exactly alike; each offers some peculiarity if carefully observed.

Symptoms.

Various signs announce the approaching termination of pregnancy with the advent of labour.

One of the most important of these is the enlargement of the udder, which becomes swollen and tender, and this is most marked in animals whose milk is not utilised after the weaning of the young. For example, in the

mare the swelling of the mammæ is sometimes so considerable that it may extend along the abdomen or pass backward between the thighs and extend as high as the vulva, forming a prominent ridge. The skin in this area becomes hot and indurated, and may lead an inexperienced person to believe that something is wrong.

In the cow, the teat at a later period yields a serous fluid on pressure, the fluid gradually becoming thicker, and forms later colostrum or first milk.

In the mare, the fluid secreted oozes out and forms a crust around the teat, and this is commonly known as waxing.

The vulva swells, the lips becoming soft and flabby, the lining membrane is reddened and a glairy mucus covers it, and in the cow becomes so abundant that it is discharged in long filaments, soiling the tail and hocks. Its use is to lubricate the genital passages, and so aid expulsion of the fœtus.

The abdomen now becomes more pendant, the croup looks hollow, as do the flanks ; the animal walks sluggishly and unwillingly, and if grazing with others is disinclined to follow them, but seeks a remote and quiet place in which to bring forth her young.

Normal Parturition.

When the time has arrived for the birth of the fœtus, the membranes covering it become detached from the walls of the uterus, enter the os or mouth of this organ, pass through into the vagina, and protrude from the lips

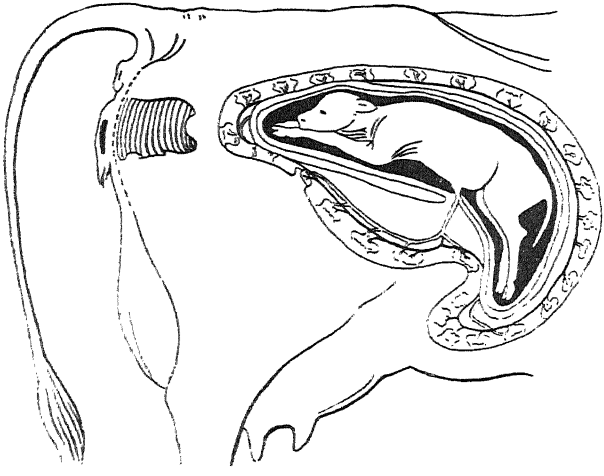


Fig. 2.—A normal presentation.

of the vulva. In the meantime the nose and head of the fœtus, resting on top of the two forelegs, pass through to the vagina in the same way. At the same time the labour pains become more marked, the uterus contracts, and with the aid of the contraction of the diaphragm and abdominal muscles the fœtus is expelled. This constitutes a normal case in which no artificial aid is required to effect delivery.

Difficult or Abnormal Parturition.

Any alteration in the presentation of the fœtus from the preceding is considered as abnormal, and assistance is invariably necessary to enable birth to be accomplished.

In all cases of difficult presentation a careful examination of the fœtus must be made by passing the hand directly into the uterus, in order to get as accurate an idea as possible of the position of the fœtus, and so determine the cause of the animal's inability to effect delivery. When this has been done, it is advisable to consider the most effective procedure to be adopted, in order to deliver the fœtus as quickly as possible and with the least detriment to the mother. Very often a more or less easy abnormal presentation is converted into a difficult one through want of careful examination and consideration of the line of operation to be carried out.

Before commencing to ascertain the position of the fœtus, or to render assistance, the hands and arms of the operator should be thoroughly washed with warm water and soap, to which a little lysol has been added, in order to prevent any possibility of introducing micro-organisms which might set up septic inflammation.

Any cords or hooks which are to be used for mechanical extraction should be thoroughly sterilised—in the case of cords by soaking in a 4 per cent. solution of lysol, and in the case of hooks, or a knife if it is to be used, by boiling for twenty minutes.

Difficult Presentations.

To deliver in a case as illustrated in Fig. 3, take hold of the fetlock, push it gently backwards so as to flex the knee: then incline the limb to its proper side; now extend it, and, if necessary, assist birth by gentle traction on both limbs.

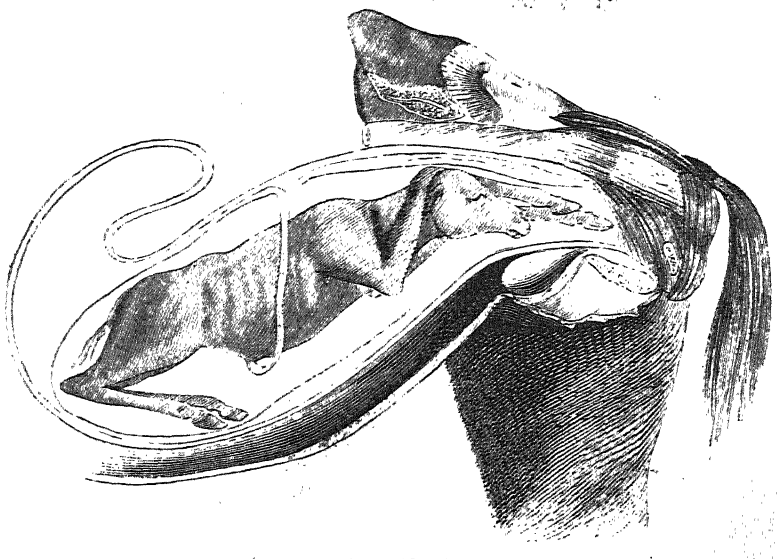


Fig. 3.—Head and fore-limbs presenting, with one fore limb crossed over the neck.

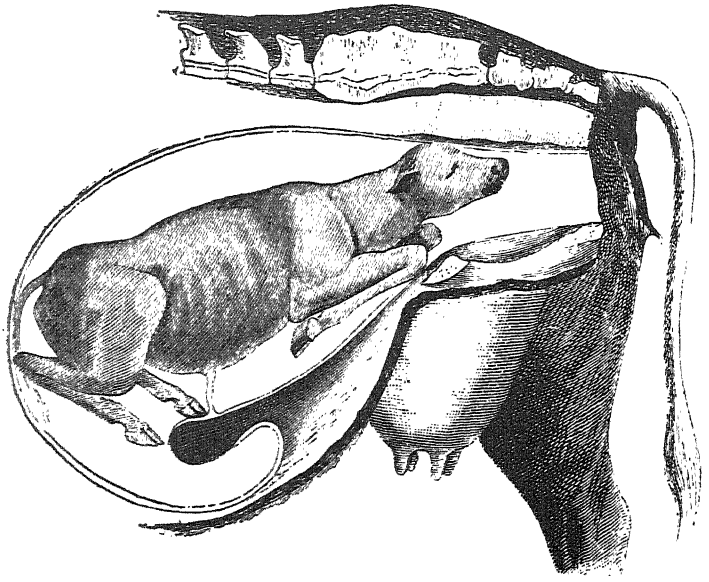


Fig. 4.—Both fore-limbs retained, bent at the knees and head alone presenting.

When occurring as indicated in Fig. 4, first secure the head by means of a rope round the neck or placed round the upper jaw, and push it back into the uterus.

Then feel downwards for the fore-limbs, and extend them one by one into what should be their normal position; in doing this the hoof is grasped and brought up towards the middle line of the body, the knee in so doing being directed towards the flank of the mother.

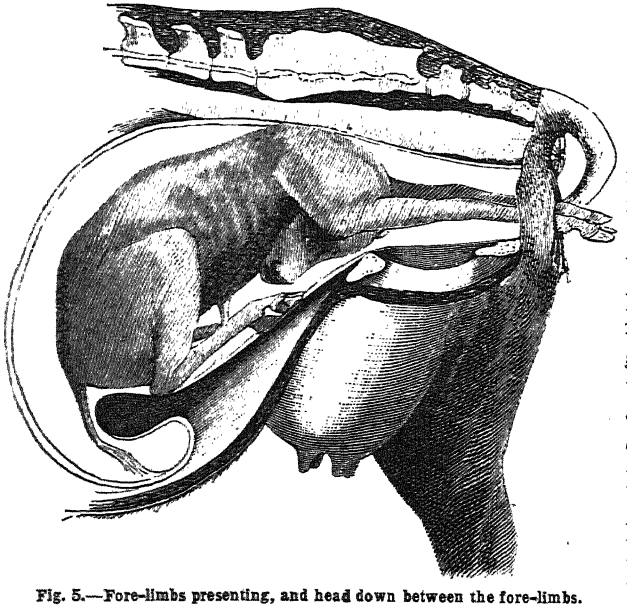


Fig. 5.—Fore-limbs presenting, and head down between the fore-limbs.

As each limb is brought up into position it is roped; then with gentle traction on the three ropes delivery is usually easily accomplished.

When the head hangs down between the fore-limbs, rope them

with separate ropes, then pass the hand down between them until the nostrils are reached, grasp them and draw the head firmly upwards. If this is not successful, attach a rope to the upper jaw, get an assistant to pull gently on this, while the operator pushes the head gently backwards ; the head is then soon brought up into the normal position and delivery effected.

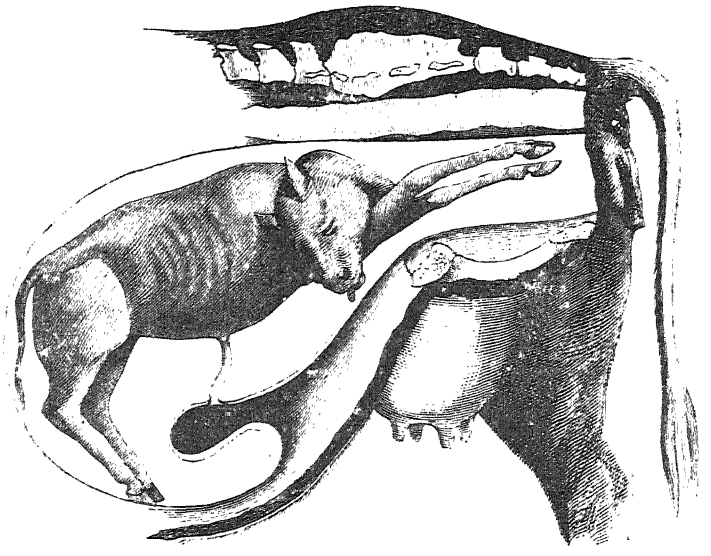


Fig. 6.—Fore-limbs presenting, and head back resting on the shoulders, the neck against the brim of the pelvis.

In a case similar to Fig. 6, secure the feet with separate cords, and pass a cord around the lower jaw. Apply steady traction to the rope round the jaw, at the same time apply backward pressure to the chest ; as a rule, this is all that is necessary. If, however, this fails, in addition to measures already adopted, a blunt hook may be fixed in the orbit, and pulled upon gently, thus getting the head into its proper position for delivery.

This is a much more difficult presentation in the mare, owing to the longer neck of the foal, and the more violent uterine contractions in this animal. This generally results in the head being pushed backwards towards the side of the chest, abdomen, or even the flank.

In these cases it is often necessary to remove a fore-limb at the shoulder.

Posterior Presentations.

When occurring as in Fig. 7, secure the tail and apply ropes to each of the limbs, when delivery is easily accomplished with gentle traction.

Under the circumstances illustrated in Fig. 8, return fœtus to the uterus by steady repulsion, sufficiently far to reach the limbs. The hand is then passed down, and the limbs brought up one by one, got into the passage, and

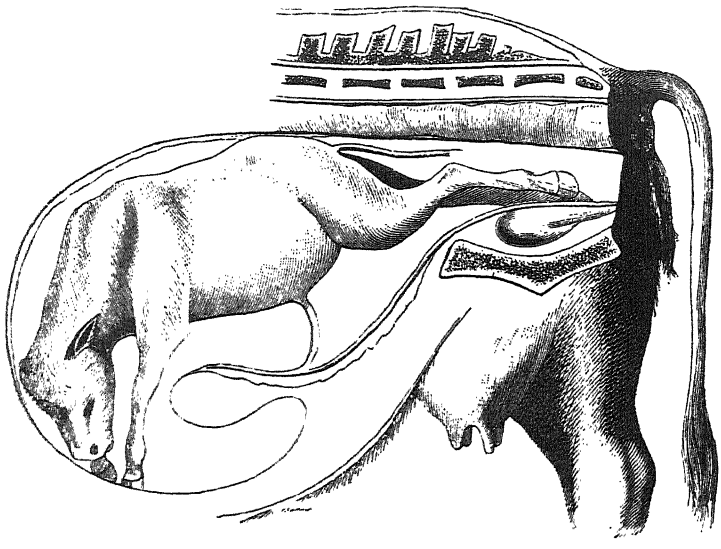


Fig. 7.—Hind-limbs and tail presenting.

roped. Care should be taken to bring the hoof upwards towards the middle line of the body, the hock being directed towards the flank of the mother. All that is now required to effect delivery is gentle traction.

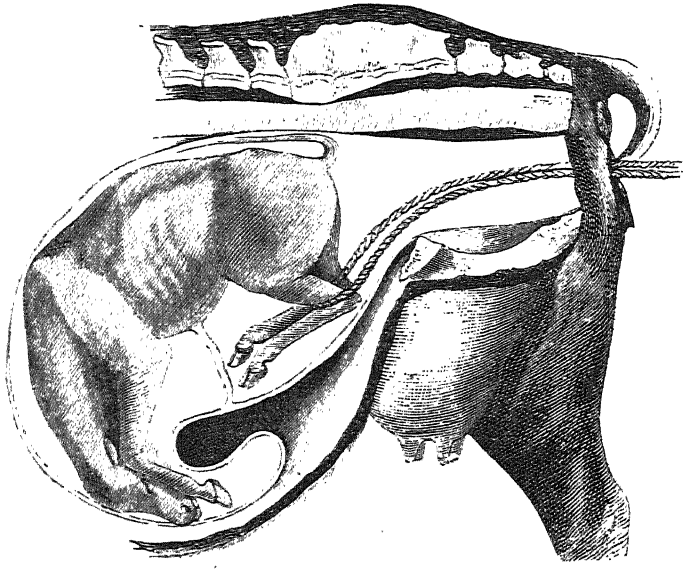


Fig. 8.—Hocks brought on the brim of the pelvis.

In the case of thigh and croup presentation push the fœtus well forward, pass a cord round the thigh, flex the limb as much as possible so as to get at the hock, still pushing the breech forward, pass the hand down till the foot is grasped, and proceed as in the previous case.

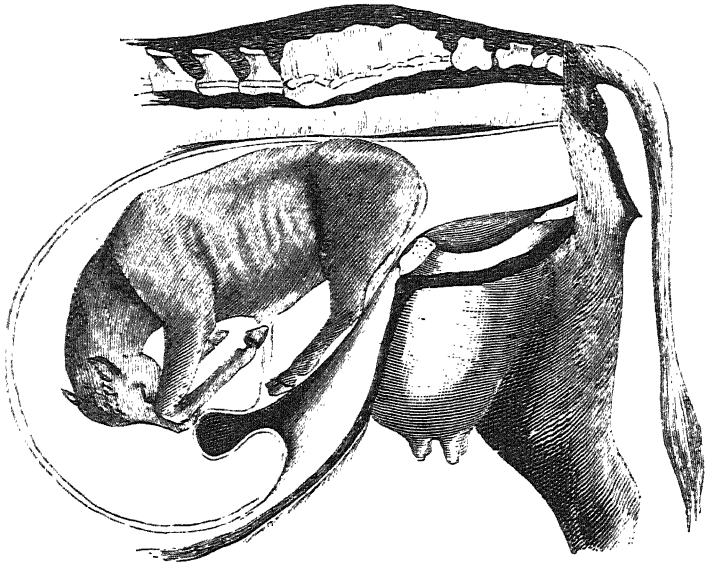


Fig. 9.—Thigh and croup presentation.

Retention of the Afterbirth.

In the Cow.

If the cleansing comes away on the third day after the calving no trouble need be expected ; if, however, it is delayed beyond this period the following treatment might be adopted. Give the animal the following drench: —

Epsom salts	1 lb.
Nitre	½ oz.
Powdered ginger	1 oz.
Water	1½ pints.

If readily obtained from a chemist, the addition of 1 oz. of tincture nux vomica to the above drench is valuable. The uterus requires attention, and it should be washed out once daily with a ½ per cent. solution of lysol, so as to endeavour to prevent septic inflammation of the uterus. By keeping the organ healthy, it aids in its contraction, and facilitates the expulsion of the membranes.

The membranes should not be allowed to drag on the ground at the back of the animal, but should be wound round a piece of straw or tied to a brick. The latter is useful, as it exerts a slight strain on them, and favours their separation from the walls of the uterus.

In the Mare.

If the cleansing does not come away after twelve hours have elapsed from the time of foaling, it must be removed. To do this, one must find the margins of the rupture in the membranes through which the fœtus has been expelled. After securing the torn border, draw it out through the vulva and hold it, exerting enough traction to render it tense; then pass the other hand into the uterus, pushing it carefully along between the membranes and the walls of this organ, thus gradually detaching them.

This process must be carried out slowly and carefully around the whole of the body of the organ, the membranes being gradually detached until its horns have been reached and included.

The uterus should be washed out for a day or so with ½ per cent. solution of lysol to render it aseptic, and prevent the setting up of inflammation.

In these cases a good dose of laxative medicine, such as 1 to 1½ pints of linseed oil is always advisable.

Metritis, or Inflammation of the Uterus.

This may result from injuries caused through a difficult parturition, or may be due to instruments which have not been properly sterilised, or from the hands and arms of the operator when not carefully washed with a reliable antiseptic. In most cases, however, it is generally the result of the retention of a portion of the fœtal membranes or afterbirth.

Symptoms.—In very acute cases, shivering, rapid breathing, quick small pulse, becoming almost imperceptible; temperature, 105–106 degrees Fahr. The animal becomes dull, there is a period of unconsciousness, and death occurs in three to four days. As a rule, however, the animal appears all right for a day or so after parturition, then becomes dull, refuses food, rumination stops, temperature is 2 to 3 degrees up, pulse quickened, straddling gait when made to move, tenderness of the abdomen on pressure, respiration impeded somewhat, due to abdominal tenderness; appetite variable, and may sometimes remain fairly good. The animal often strains a good deal, and there is a discharge of a dirty greyish, or maybe chocolate-coloured, fœtid matter from the vulva. On examination, one finds the vulva and vagina soft and flabby, the lining membrane much injected, and the uterus enlarged and soft.

Treatment.—The uterus should be washed out with a ½ per cent. solution of lysol, 2 gallons of the solution being injected and then allowed to escape, and the process continued until the water comes away quite clear. This should be carried out twice daily, the solution being used at blood heat.

Improvement is noticed when there is a decreased discharge, absence of fœtor, and the appearance of an almost colourless discharge instead of the dirty grey or chocolate one.

The following drench should be given twice daily, morning and evening:—

Spirits ether nit.	2 oz.
Tincture nux vomica ...	2 drms.
Water	1 pint.

If fever is very marked, ½-oz. doses of sulphate of quinine may be administered in half pint of gruel twice daily.

The animal should be kept warm and well rugged, and given a liberal supply of fresh drinking water.

Eversion of the Bladder.

This may occur in any animal, but has been recorded most often in the mare, and is caused by inter-abdominal pressure aiding with the contractions of the uterus in the expulsion of the fœtus.

The weakened state of the muscles surrounding the urethra, or opening of the bladder into the vagina, and also in the mare the fact that the urethral opening is very large, renders this accident liable to occur before, during, or after parturition.

Symptoms.—A pear-shaped swelling appears at the vulva, and varies in size according to the degree of congestion, which is dependent largely upon the time the organ has been everted. It is attached to the floor of the vagina, where the opening of the organ normally exists.

The urethral opening has disappeared and its place taken by the everted bladder. On examination, upon either side of the neck of the swelling, two small openings may be seen, with which are the openings of the ureters, two small tubes which carry the urine from the kidneys to the bladder, and from which urine may be seen escaping drop by drop.

Treatment—Wash the organ thoroughly with a weak solution of permanganate of potash, or with a salt solution, about 80 grains of salt to the pint of water, after which it may be returned. If the eversion is only recent it is not difficult. Grasp the organ with both hands, applying firm and evenly-applied pressure, which gradually forces the blood out of the organ and reduces its volume; now commence at the point nearest the floor of the vagina, and manipulate it back through the urethral opening.

To lessen the straining of the animal during the process of returning the organ, either of the following drugs may be given in a pint of water:—Tincture opii, 1 ounce; or chloral hydrate, 1 ounce; preferably the latter, which may be repeated every four hours, to prevent the animal straining after the organ has been replaced.

Eversion of the Uterus.

A coming down of the calf or foal bed, the uterus being turned inside out. It may be only partly everted and not seen outside, or completely so and hanging to the ground.

This condition is most common in the cow, and often the fœtal membrane (afterbirth) is not separated, and is seen adhering to it.

Causes.—Not always apparent; often occurs an hour or so after parturition, and frequently there is a very relaxed condition of all the tissues about the pelvis, and if the animal is much debilitated, this accident often occurs. Animals lying after parturition and unable to rise, especially when

on sloping ground, are liable to it; the fœtal membrane, becoming detached everywhere except at the apex or point of the horns, tends by its weight to draw the horn into the body of the uterus. Once it reaches there, it excites straining, thus leading to eversion.

Symptoms.—The appearance of the organ either with or without the fœtal membranes being adherent. The animal may show symptoms simulating colic if on her feet, continually rising up and down, exhibiting much uneasiness, obtaining relief as soon as eversion has occurred.

If not attended to, the animal again becomes uneasy, commences to strain, and the temperature rises; the organ becomes greatly distended with blood which is unable to return, so that later it becomes black in colour.

Treatment.—First examine the animal as to her general condition. She may be so exhausted that she requires a stimulant. in which case 2 to 4 oz. of sweet spirits of nitre or whisky might be given in 1 pint of water. If she is standing up procedure is easier; so that, if she is lying down, endeavour to get her up.

In the event of the fœtal membranes being still attached to the uterus, these should be carefully removed, and the organ thoroughly washed with warm water, to which a little lysol should be added. Every care should be taken to thoroughly cleanse it, and water should not be spared.

After cleansing, the organ should be placed in a clean sheet and held up above the level of the vulva, then, beginning at the horns, with gentle pressure, commence to reduce its size by squeezing out the blood. The application of plenty of cold water at this time is of value, acting, as it does, as an astringent.

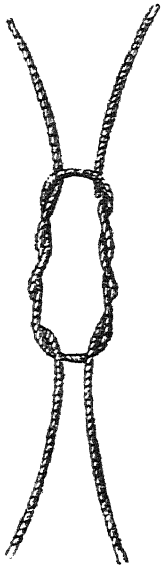


Fig. 10.—Truss to fit over vagina.

When ready to replace it, see that the animal's hind quarters are higher than the fore, and if necessary raise them. In these cases, if in a hilly paddock, let her stand with her head down hill.

Plenty of assistance is necessary, one man at her head, two supporting the uterus, in addition to the operator.

When ready, commence with the portion nearest the vulva, manipulating it in bit by bit, and taking every advantage when the animal is not straining. Do not be in a hurry. It is often a long and arduous task, as each time the animal strains it requires all one can do to keep what has been returned from again coming out; but the size gets less as one proceeds.

Once the greater portion has been returned, put the closed hand on the furthest-out portion, and endeavour by steady strong pressure to replace the remainder, and once it is all returned do not withdraw the hand and arm for some time.

If the animal is straining very much, she may be given an ounce of chloral hydrate in a pint of water to diminish sensibility, and it may be repeated in four hours if necessary.

It is advisable to apply a truss before leaving her. This should be kept on for three or four days, and the illustration here shown is one easily made with an ordinary piece of rope.

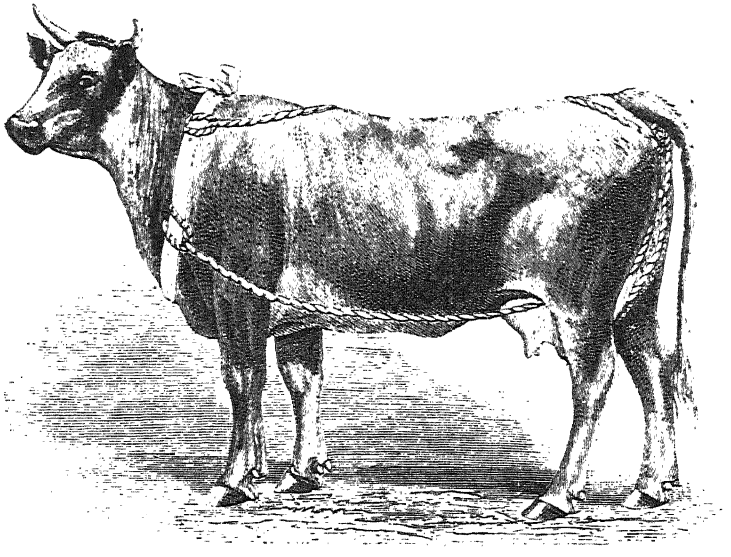


Fig. 11.—Showing method of applying truss.

Worms in Horses.

An inquiry from Curlewis was recently received regarding a possible method of purifying tank or dam water for use by stock, especially with a view to ridding horses of worms, or at least keeping them free from such parasites. The writer had been informed that bluestone was good but did not know the quantity to use.

In reply, the Acting Chief Inspector of Stock stated that the water itself was not the dangerous factor in the infestation of worms, as the embryos and eggs were passed out with the horses' dung and deposited on the grass to which they become affixed.

Horses became infested through feeding over damp marshy spots much more than by the actual drinking water. Copper Sulphate (bluestone) is used as a remedy for worms in horses, but putting it in the drinking water would not be of much benefit, and to do any good in the way of destroying what worms were present would have to be of such a strength as to render the water unpalatable.

The Bolton Hive for a Farmer's Apiary.

R. G. WARRY, Demonstrator in Apiculture.

WHERE bees are farmed merely as a "side line," no more important pursuit can very well be neglected in order to give the apiary every attention it needs; but with appliances specially adapted to apiaries not under constant supervision, with the proper number of hives, and in a good honey-bearing district, bees can be made to pay well without interfering with the essential routine of a farm.

The quantity of surplus honey one hive will produce depends upon several conditions, one of which is prompt attention when occasion demands. For a farmer who can spare but little time for bee-keeping, this is a drawback which has been very much minimised by the modified Bolton Hive.

Among the different duties which occupy a bee-keeper's time, two are found to be an annoyance: swarming, and robbing carried on by the bees —both call for immediate attention. The former is profitable in a sense, whilst the latter is nothing but a loss, which may develop into a disaster if not promptly checked.

The Swarming Season.

To reduce the number of swarms likely to issue in the swarming season, does not necessarily mean less work, but it does mean that work done for this object can be planned and time found for it, whereas if no attempt is made in this direction, sudden attention to the apiary becomes imperative without warning, and often at a time when all are busy elsewhere.

To cope with swarming and check it as far as possible, a brood chamber which admits of thorough and rapid examination is essential. Such a brood chamber is found in the modified Bolton Hive.

When speaking of swarming and condemning it as a detriment, it must not be forgotten that a prime swarm issues with the intention of improving itself quickly and is fully prepared to do so, whereas a new colony, the outcome of an artificial method of increase, is forced to improve itself and will not display the same vigour at the beginning as a prime swarm. But allowing natural swarming all the credit that can be given it, swarms prove more of a hindrance than a profit in "out-apiaries" and "side-line apiaries," if only for the following reasons:—

From an apiary not getting constant attention, swarms will issue without warning; if unobserved, they are lost, and are frequently followed by after-swarms which are a still greater loss; if seen, swarms must be hived at once, meaning that no matter what the owner may be engaged in at the moment it must be left and his swarm hived. A small apiary can give a lot of trouble in this way.

In the early spring, colonies become numerically strong in drones and worker bees, and presently decide to swarm. The first practical indication that a hive intends to swarm is given by the presence of a number of queen cells in various stages of construction. A strong drone flight is often a sign that swarming will take place in the near future, but that it is actually at hand is shown by queen cells.

These queen cells are a natural and special provision made by the queen and bees to ensure the continuation of egg laying in the parent colony after the prime swarm has left it. Under normal conditions the prime swarm will not leave until satisfied that their queen cells will prove productive. If queen cells can be quickly detected and as quickly destroyed, the colony is thwarted for a time in its intention to swarm, but in many races of bees and in hybrid bees the natural inclination to swarm is so strong that their determination to do so makes them start a fresh batch of queen cells after the first has been removed. To find queen cells in an ordinary ten or eight-frame "Langstroth" brood chamber takes time, as it means that nearly every comb if not all, must be withdrawn and examined separately.

Cells can be seen and destroyed in the modified Bolton Hive without removing a single comb, provided care has been taken to get the frames *completely filled with comb.*

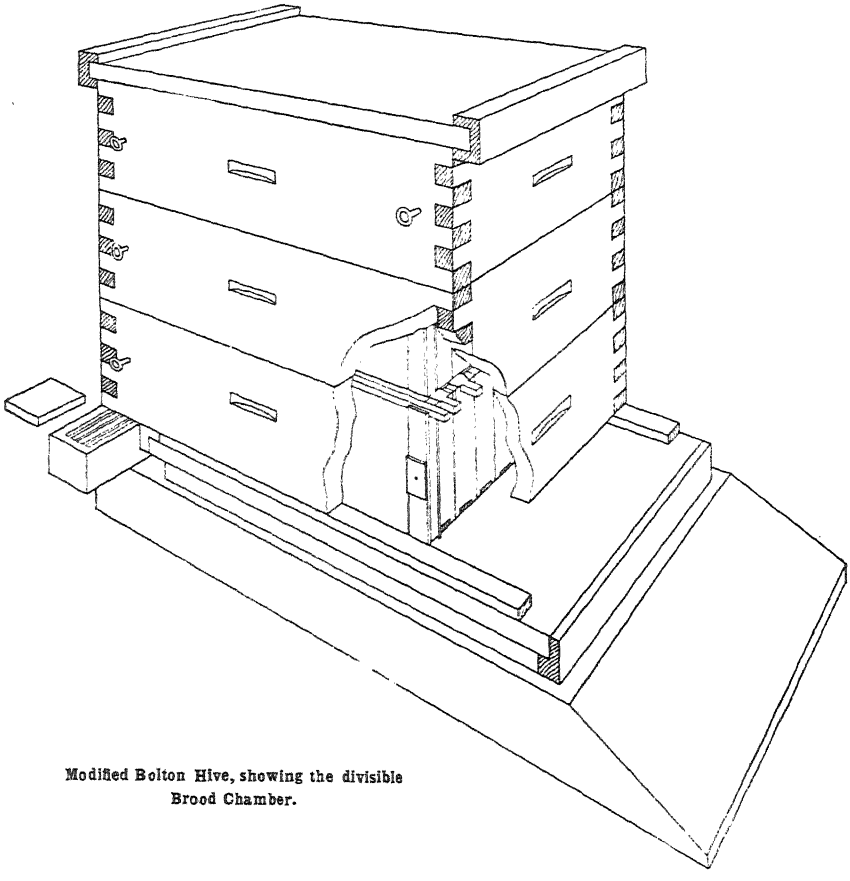
Comb Building in the Bolton Hive.

Combs in use for brood-rearing and built in the brood chamber of an ordinary Langstroth hive, do not completely fill the frames they are built in. A bee-space is left between the bottom bar of the frame and the bottom edge of the comb, whilst often between the end bars of the frame and the comb are vacant spaces. All these spaces offer the bees suitable places in which to build queen cells, and make their detection and destruction more difficult for the apiarist.

The main features of the modified Bolton Hive is its divisible brood chamber. Considering for example, a swarm hived on comb foundation in a Bolton brood chamber, the top set of combs, or those in the upper section of the brood chamber, approximately correspond to the upper half of the comb in a Langstroth brood chamber, and are built out as completely as the upper half of a Langstroth comb is; but the lower set of Bolton frames will be treated by the bees in the same way as the lower half of the Langstroth frames, and comb will not be attached to their bottom bars.

In manipulating the Bolton hive, advantage is taken of the fact that bees will not suffer this space between the *top bar* of the frame and the comb, neither will they allow the space to remain unfilled with comb if they find it crossing the centre of their brood nest.

As soon as the bees have finished comb-building to their satisfaction, leaving this space along the bottom bar of the lower set of frames, the defects in the combs have to be remedied to the apiarist's satisfaction. This can be done in either of two ways :—Firstly, by simply changing the places of the



Modified Bolton Hive, showing the divisible Brood Chamber.

two cases of combs; the objectionable space referred to now passes through the centre of the brood chamber instead of the bottom. This is not a natural position for it, and the bees complete the comb. Secondly, by tightening the screws at the side of the lower half of the brood chamber. This case of combs can now be turned upside down and placed on top of the other. What was at first the lowest set of bars of all in the brood chamber now becomes the uppermost, with a vacant space immediately below it; this again is an unnatural position, and the comb will be properly completed.

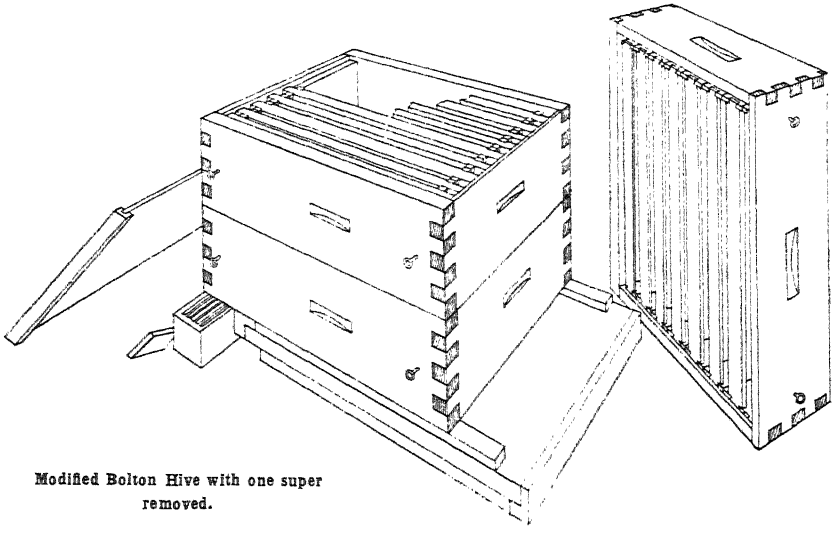
Delaying Swarms with the Bolton Hive.

The modified Bolton Hive is coming quickly into favour with many of our best bee-farmers. Some of them however, who speak from experience, do not recommend the plan of inverting a set of combs for any reason whatever. Provided always that comb completely fills the frames, inversion is unnecessary, the first plan of merely changing places with the cases of frames answers all purposes but one—namely, the destruction of queen cells—which can be

accomplished by cutting them away from the bottom bars of the frames. With complete combs built as described, the bees have no available place to construct queen cells but along the bottom bars of combs; in this position, which is compulsory, the cells cannot easily be missed when the cases of frames are tilted, little more than a glance is sufficient to detect them all. If cells are present, the colony can be swarmed artificially, or the cells cut out and the swarm delayed.

Not infrequently, bees will tear down comb to make room for building queen cells. Where time is valuable, and there is any doubt that all queen cells would be seen and cut away, the section of the hive containing the cells can be inverted, which will cause them all to be destroyed.

In an instance where a swarm is delayed through depriving it of queen cells, no swarm will issue, on an average, for eight days, but on the eighth day after the destruction of queen cells, another examination is necessary. If the colony is still persisting in its determination to swarm, and has again built queen cells, it is better to artificially divide it into two than to delay the swarm a second time, for to deliberately baulk the bees of their object causes them to become dispirited and a loss of energy is manifested at once. There is no harm in intercepting queen cells *once*, but a second time is detrimental.



Modified Bolton Hive with one super removed.

Honey-choked Brood Chambers.

With the Bolton method of handling bees at swarming time, it will be seen that in place of manipulating combs separately, whole sets of brood combs can be thoroughly examined for queen cells and treated in about the same time as two or three separate Langstroth brood combs.

In many minor details the modified Bolton Hive is superior to other forms of the movable frame hive. One cause of swarming, also a cause of loss of

brood, is a honey-choked brood nest. Along the top of practically every brood comb there is a depth of comb occupied by stores. Sometimes this depth is excessive, leaving a vigorous queen too small an area for egg-laying. Changing the place of, or inverting the top story of the brood chamber, will cause the offending honey to be placed in a position in which the bees will not permit it to remain. They will remove it, not to the top of the brood nest again (for through the changing places or the inversion, this space is occupied with eggs or brood), but into the surplus supers.

Robbing.

The Bolton Hive as supplied by the factory is so well made and of such low cost that it does not pay any busy person to attempt making his own. The hive, when properly nailed and painted, is a bee-tight hive in which weak colonies, always a target for robber bees, will find all the protection from pilfering that can be given.

Extracting.

Extracting the honey crop also calls for time. The Bolton hive will make no difference to the time taken in actually extracting the combs, but the time given to freeing the combs of bees and removing them to the honey room prior to uncapping is greatly diminished by the use of this hive. The side screws hold the frames so firmly, that a super full of honey, whose combs are covered with bees, can be jarred bodily on the ground, until all the bees are got rid of. Comparing this Bolton "shake out" method with the old practice of shaking and brushing the bees from each comb separately, there is a distinct advantage in favour of the modified Bolton Hive. Where the clinging Leather Italian bees are used, it may not be possible to dislodge every one by jarring, for they are extremely tenacious, but a narrow brush will sweep them out from between the frames.

Two Uses for the Side Screws.

Much time is spent on ordinary hives in removing supers and placing them carefully aside whilst at work on the frames under them. Storeys of the Bolton Hive can be removed and set down anywhere, on end or on either side; if the screws are tightened, the frames are immovable.

In practically all districts propolis is a nuisance, in some more so than in others, causing all patterns of self-spacing frames to become glued together. Bolton frames are "closed-end" self-spacing frames, if left loosely touching each other, bees are liable to glue them, making more work for the hive tool, but if always kept moderately tightly pressed together by means of the side screws, they will not be interfered with.

Thus where the modified Bolton Hive is in use, swarming can be reasonably held in check; every inch of available comb space is profitably occupied; and extracting, with other manipulations, can be quickly done; whilst to a great extent, work can be foreseen and planned—a consideration to a busy farmer keeping bees as a "side line."

Ostrich Farming in Australia.

T. J. HERBERT, Advisory Expert in Ostrich Farming.

For a number of years ostrich farming was confined to the Cape Colony, with the exception of an attempt by the French to establish it in Algiers. Later on, people of other countries began to turn their attention to the ostrich, and a number of birds were taken to North and South America, India, and Australia. The Cape farmers became alarmed at the prospect of much competition from outside, and a Bill was introduced and passed by the Cape Parliament, imposing an export duty of £100 on each ostrich taken from the Colony, and £10 on each egg, which has since been amended to "total prohibition of ostriches and their eggs from the Cape." This afterwards became law throughout the South African Union States, and spread from there to German West Africa and the Portuguese territory of Mozambique.

Several shipments of birds have from time to time been imported into Australia. In 1873 the Melbourne Acclimatization Society imported some; and later, in 1881, Mr. W. Malcolm set about establishing ostrich farming in South Australia, and imported a number of birds. A farm was started at Gawler, and a large number of young ostriches were successfully hatched and reared. About this time an Act was passed by the South Australian Government, with a view to encouraging the establishment of the industry, by offering the fee-simple of 5,000 acres of land to the party who first placed 250 ostriches over one year old upon the land. Mr. Malcolm's venture was formed into a company, and ultimately the required number of ostriches was reared and placed upon the land near Port Augusta. The conditions of the Act being complied with, the fee-simple of the 5,000 acres was granted by the Government.

The country in the neighbourhood of Port Augusta, with an annual average rainfall of only 9 inches, must be classed as inferior pastoral land. Yet the birds have thriven, and a flock of 700 birds is now pasturing on the farm without any artificial feeding, except the chicks. These are fed, until they are a few months old, on lucerne and bran. One and a half acres of lucerne are grown on the farm, watered from the town water supply. The farm is greatly handicapped by not being able to produce more green fodder, otherwise a greater number of chicks could be reared.

Mr. W. H. Williams, the present manager of the Company, came over from South Africa with his parents when five years old. His father, the late Mr. Thomas Williams, served his apprenticeship to Mr. A. Douglas, the pioneer of ostrich farming in South Africa, a high premium being demanded in those days to learn the management of ostriches. The Company secured Mr. Williams' services, and he came out under contract to take the management

of their farm at Port Augusta. The knowledge of the father became instilled in the son, who afterwards became manager.

Mr. Williams, like many other breeders of ostriches, prefers letting the birds do part of the incubating of the eggs, removing them after the birds have been sitting from two to three weeks, and placing them to an incubator. Four Cyphers machines of 40 egg capacity are in use.

Birds from this farm were, with one or two exceptions, the origin of all the ostriches now pasturing on the various farms throughout the Commonwealth.

To make a test as to what extent lucerne feeding will improve the plumage of ostriches, Mr. Williams sent eight birds to Melrose, about 40 miles distant, where they were grazed in a lucerne paddock. The feathers were clipped and sold to a Melbourne manufacturer, realising £7 per clip each, more than double the amount realised from the same birds when grazed on the scantily grassed paddocks at Port Augusta, thus affording a good object lesson to the man who can grow lucerne for this purpose.

The executors of the late T. R. and S. Bowman have a flock of 400 birds running on their station near Lake Alexandrina, the nucleus of which came from the farm at Port Augusta.

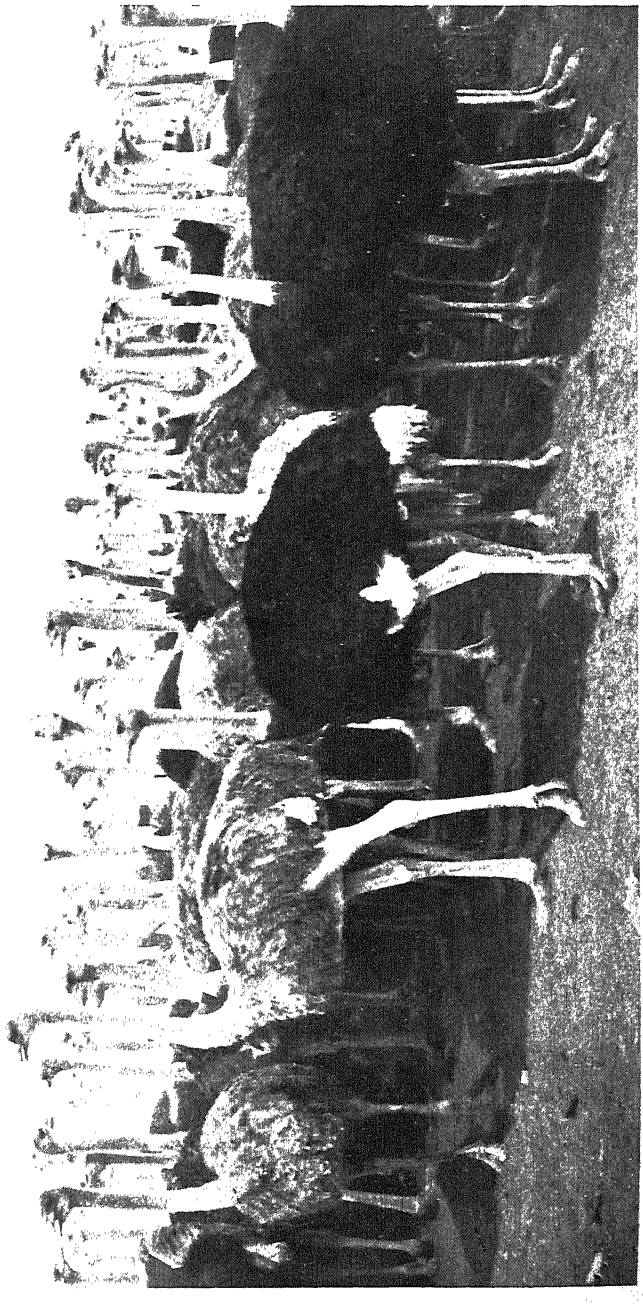
Ostrich farming in New South Wales to-day can be considered well beyond the experimental stage. For a number of years the industry comprised only a few birds owned by Mr. J. Barracluff, of South Head, near Sydney. Under adverse circumstances these birds throve well, and in a few years Mr. Barracluff had over 100 head, but owing to the limited area of the farm little expansion of the flock was possible. The feathers are made up and sold on the farm, and realise good prices.

In 1900, a pair of ostriches was placed at the Hawkesbury Agricultural College, and they and their progeny have been the admiration of the thousands of visitors to that institution ever since. The feathers have always found a good market; and a few years ago an exhibit was sent from the College to the Franco-British Exhibition and was awarded a Gold Medal. This is proof enough that even on the indifferent land of the College farm the birds will thrive and furnish remunerative returns.

A flock of twenty-four adult birds, the progeny of the College stock, was taken to Queensland, where attention is now being paid to the subject of ostrich raising.

In 1905, Captain J. E. Cairnes, now of Nardoo, 17 miles from Coonamble, started ostrich farming with a partner, Mr. R. B. Sanderson, at Gilgandra. The beginning was made with six pairs of birds purchased from the South Australian Ostrich Company. In 1907, when the flock had increased to sixty-seven birds, they were removed to Coonamble. The ostriches now number 550, and the aim is to still further increase them.

The farm comprises 7,500 acres, of which 2,500 are devoted to ostriches and the balance to sheep. Captain Cairnes intimates that he receives a greater net profit from the ostriches than from the sheep, though the area occupied by the latter is double the size, and the returns from the ostriches



A profitable Flock of Australian Ostriches.

are on account of sales of feathers only. No birds have been sold from Nardoo, as the number has not yet reached the total proposed to be kept. It can thus be seen that this industry is capable of increasing the value of the production of our great western lands.

An artesian bore provides abundance of water. The country consists largely of dark sandy loam, with belts of timber and some "black soil" plains. It is known as "herbage" country, and carries very little grass. The chief winter pasture plants are crowsfoot, trefoil, wild carrot, parsnip, and a plant known locally as lamb's tongue. In summer, tar vine, bull vine, and salt weed are plentiful. This "herbage" country always keeps stock in condition even when there is no feed observable to the untrained eye. At Coonamble Captain Cairnes was not compelled to hand-feed his ostriches at any time, not even during the drought of last year, until a fortnight before the drought broke.

It is roughly estimated that land will support three times as many sheep as ostriches. This country is considered capable of carrying a sheep to 2 acres; thus on 600 acres 100 ostriches can be maintained without difficulty, running on natural pasture alone. But to grow fodder for the birds will certainly enhance the returns, not only by increasing the carrying capacity of the land, but also by giving a better quality of feather, and a greater increase of chicks. Lucerne does very well on the dark loam under irrigation with bore water. This fodder is rich in protein, and its advantages for the production of feathers are indicated by theory and supported by practical experience. Captain Cairnes has 30 to 40 acres under lucerne, on land which appears to be very suitable for the legume. The crop was sown three years ago, and gives a cut about every six weeks in summer.

But Captain Cairnes grows lucerne merely as an insurance against drought. The hay is being stored in a big shed, and will only be used in case of necessity, the ostriches deriving their subsistence from the natural herbage. When lucerne is to be fed it is chaffed, damped, and then mixed with a little bran or maize.

The soil at Nardoo, to all appearances, seems to be free from stones or gravel, yet it is not found necessary to give the birds any grit; the keen eye of the ostrich finds sufficient of this for mastication.

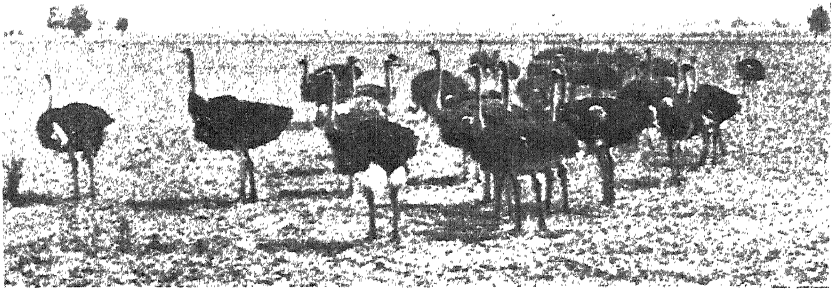
Artificial incubation is practised at Nardoo, but Captain Cairnes is of opinion that natural hatching has some advantages.

At Coonamble the birds begin to lay when from 2½ to 3 years old. Nesting commences about July, and the hatching season runs on to March.

The writer became interested in ostrich farming in South Africa in 1902, and remained in that country until 1908, returning then to the Commonwealth thoroughly convinced that Australia is equally as well adapted, if not more so, than South Africa for the raising of ostriches and production of plumes. After making several inquiries as to where ostriches could be obtained—the prohibition embargo had already been placed on the export of ostriches from South Africa, otherwise an effort would have been made to bring a few birds from there—he decided upon a purchase from the South

Australian Ostrich Company of Port Augusta, where nine birds (four cocks and five hens) from 2 to 3 years old were secured, and transported by train to Temora, where some land had previously been purchased. The locality was not considered the most suitable part of the State for an industry of this kind, but the price of land was tempting at that time. The ostrich industry here was coupled with wheat-growing, and sometimes a few sheep were run with the birds, which it was found all worked well together.

The birds could be turned on the forward crops in the winter, and run until the middle of the spring, and do well also in the stubble paddocks after harvest. The property at Temora was disposed of last year, and the birds removed to the Yanco Irrigation Area. The present farm consists of 408 acres, of which 108 are irrigable. It is intended to lay all this down with lucerne. One paddock of 12 acres was sown with rape in the spring, and carried forty-five ostriches right through the summer. This fodder is well suited for rearing young birds, and is to be preferred to lucerne for very young chicks. The flock at Yanco now numbers ninety birds.



Ostriches feeding off a paddock of Rape, at Yanco.

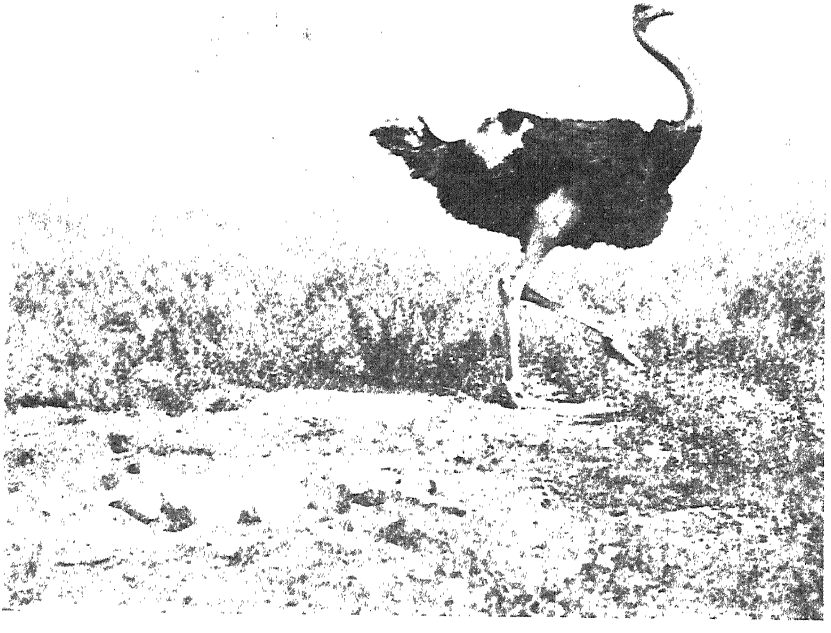
Last year twelve Soudanese ostriches were imported from North Africa and brought to the Yanco Experiment Farm, where they are being mated with a South African strain purchased in South Australia.

Management of Ostriches.

The ostrich reaches maturity at 4 years of age, although they often breed, as stated, at the age of 2½ and 3 years. They will continue breeding to a great age; in fact, the older they are the more steadily do they sit, and hatch out a larger percentage of chicks. The age to which an ostrich lives has not been fully determined. Some scientists maintain that this bird lives to the age of 100 years, though others have put it as low as 40 years.

Breeding birds are generally confined in small paddocks from 1 acre upwards, according to its carrying capacity. The larger the area is, the better, if no provision is made for feeding on lucerne or other artificial grasses.

In fair-sized paddocks they will lay and hatch out their chicks without any artificial feeding except in winter or in dry seasons, when a little grain, such as maize, wheat, or barley, should be given—3 lb. of either of these, if fed daily, will keep them in good condition. A pair of birds is usually put in each paddock, though two or three hens may be run with one cock, and an increased number of chicks obtained, but in this case it will be necessary to have an incubator, as more eggs will be laid than can be covered. The hen does not sit at night time. The cock bird takes charge of the nest from about an hour before sunset and remains sitting until the hen returns the next day, which is usually from about 8 to 9 a.m., according to the temperature. If the day be cold she will be later; if warm, earlier. If it should be raining, the cock will sit right throughout the day without leaving the nest.



Cock Bird guarding eggs at Yanco.

The best position for the paddocks is where there are no public roads near, and where the birds can remain undisturbed as far as possible. When they commence pairing the cock becomes vicious, and on entering the paddock it is well to be armed with a good strong stick to keep him off. The most suitable weapon for the work is a polo stick—Indian cane; it is light and can be used on horseback or on foot. If the bird should make a rush, give him a smack on the neck. It will probably knock him down; but it will not be required to be done very often, as he will soon learn who is his master.

The nest is generally found in the open, and if made in a spot where it is likely to be swamped during heavy rain, the eggs should be taken out and the level of the nest raised, so that the water from the surrounding ground may not flow into it. A shallow trench dug round the nest will effectually prevent this, and the birds often throw up this protection round the nest themselves. They generally lay from twelve to fifteen eggs before they begin to sit, and in a favourable season lay two or three hatchings. The period of incubation is forty to forty-two days, though during artificial incubation, when temperatures are run above normal, they will hatch out in thirty-eight days. The date the birds begin to sit should be noted, in order that the time when the chicks appear may be known, as sometimes they will leave the nest before the hatch is quite complete, going off with what chicks they have out. The remaining eggs, in the absence of an incubator, should be brought away and placed between several thicknesses of blanket or feather pillows, when they will generally hatch out successfully. The chicks after being kept warm for a couple of days, can be returned to the remainder of the brood with the parent birds, if they are not to be brought up by hand. The subject of rearing will be dealt with later.

Where a number of birds of mature ages is kept in large paddocks, it is necessary to keep a good lookout for the nest, as if the chicks hatch out and get a week or two old before they are found, it is rather a difficult matter to catch them. If allowed to grow up with the old birds, they become very wild and, consequently, are much harder to manage than birds that have been reared about the house. The best plan to adopt is to allow the birds to sit about three weeks on the eggs, then bring them to an incubator, where they can be finished off equally as well as though the birds were sitting on the nest; thus the birds do not get run down in condition by a long sitting of six weeks, and soon set about getting another nest ready.

Artificial Incubation.

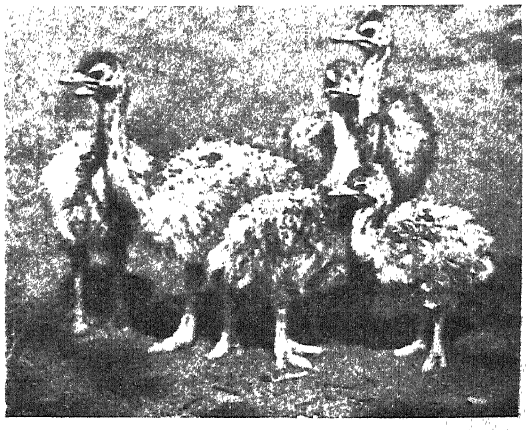
Much has been written and said regarding artificial incubation from time to time. This is not generally practised by ostrich farmers in South Africa, as they much prefer to leave it to the birds. It is in the early period, during incubation, that the greatest risk is run. Variations of temperature, too much or insufficient ventilation, and moisture, all play their part on the health of the embryo, which is but a few hours or days old inside the shell. The temperature can be measured, but the other elements—ventilation and moisture—are not so easy to control. Atmospheric disturbances also have an influence somewhat difficult to define. If the chicks can be given a good start, the hatch will most probably be a success.

To the breeder of ostriches an incubator is an article which cannot well be dispensed with, as sometimes with young breeding birds the cock will occasionally refuse to sit, and if no incubator be at hand the nest of eggs will be useless. Sometimes, during severe weather, birds, when sitting on nests located in low-lying ground, will get swamped, and the eggs should then be removed to an incubator. By the use of the machine, as compared

with the natural process, a greater number of eggs can be obtained by taking them away as soon as they are laid, and keeping three or four dummies in their place. They will sometimes lay as many as forty eggs without stopping, whereas if the eggs are left in the nest they will lay from ten to fifteen, occasionally up to twenty, and then commence sitting. It is not advisable to force the birds laying in this manner too much, as weakly chicks will be the result. A far better plan is to let the birds lay a nest of eggs, and allow them to sit on them for three weeks, then place them in the incubators. Ostrich eggs will hatch out at various temperatures; the minimum I have known to hatch out at is 98 degrees, and the maximum 103 degrees. The best results I have obtained have been from hatches that were started at 98 degrees, and increased at the rate of 1 degree every six days, until a maximum of 101 is reached, and maintain that temperature until the hatch is completed. The eggs should be turned twice a day, night and morning, and ventilated for five minutes in the first three weeks, and for ten minutes in the second half of the incubating period. The progress of incubation can always be ascertained by holding the egg against a strong light in a darkened room. At about nine days a dark spot will be noticed, and this will gradually extend until about the twentieth day the egg becomes perfectly opaque, with the exception of the air space at one end. When properly incubated the air-space should be clearly defined by a dense, perfectly opaque outline. If semi-transparent below the line the egg is not likely to be good. A day or two before hatching, that is about the thirty-ninth day, the chick will be observed to fall in the shell, the air-space becoming considerably enlarged. It will soon rise again until the egg is quite full. When at this stage it should be marked; and if in twenty-four hours the chick has not broken the shell, it should be released by cracking it at the air-space end and breaking away some of the shell.

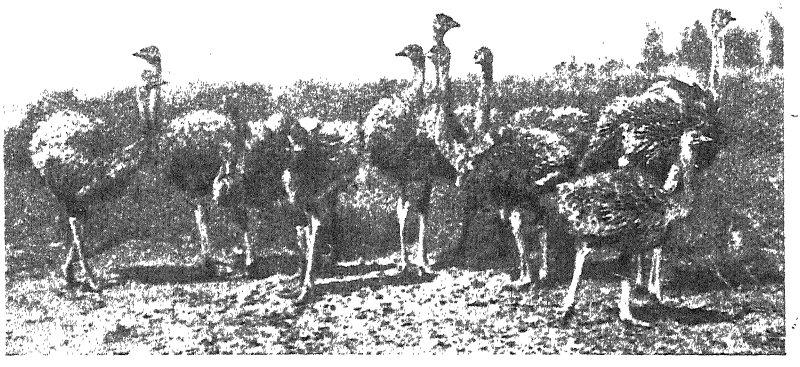
Rearing the Chicks.

When hatched in an incubator, remove all broken shells and leave the chicks in the drawer until next day, when they should be put out in the sunshine, unless it is very hot, in which case the shade would be better. A small space should be enclosed with boards to keep them from roaming about, and plenty of gravel supplied them, so that they may peck at a little of it. Return them to the incubator at night



Ostrich Chicks, two weeks old, at Yanco.

for the first week. After that place them in a box with an empty sack at the bottom, and place another sack over the top of the box, leaving a small opening as access for fresh air. On the fourth day they will begin eating any soft green food, such as lucerne, rape, cabbage, &c., and will require a plentiful supply of bones crushed small. If the weather is wet or very cold they should be kept in a light room. After the first week they can be taken out by a boy, where there is any picking of the natural herbage, and if this is plentiful they will require no artificial feeding. A little grain such as barley, wheat, or crushed maize may be beneficial if fed to them when brought in of an evening. After the first month they can be housed in a warm shed, and at three months old left out in the paddock, unless the weather be wet and cold, when they should be put in the shed at night.



Ostrich Chicks, two and a half months old, at Yanco.

Young ostriches hatched in the natural way are sometimes left with the parent birds. This practice has little to commend it, as the birds when grown up are much harder to handle than birds that are taken away and artificially reared. Catching them when they are a day or two old, and rearing them, as just described, is the custom generally adopted.

The age of the birds can be determined as follows:—At seven months old the first crop of feathers will be quite ripe—that is, the drab feathers can be pulled out without bleeding, and the long white or quill feathers can be cut. At twelve months the second crop of feathers will be well forward, and some of the cocks begin to get their black plumage, and show white on the front of the legs and along the edge of the beak. At two years old the cocks will be quite black, none of the narrow-pointed chicken feathers being visible except where the neck joins the body; the hens will similarly have lost all their chicken feathers, which will be replaced by drab. At three years old the cocks show red on the front of the legs and beak. There is then no further guide to their age.

They can be branded on the thigh when they are a few months old. The brand should consist of not less 2-inch figures or letters, or an aluminium button, similar to those used for marking sheep or pigs, may be fastened in the wing.

Taking the Feathers.

In the early days at the Cape it was usual to pluck the feathers every six months, but it was soon found that this practice in a few years rendered the birds of little value: the feathers at each succeeding plucking becoming shorter and stiffer until they were of little use. After six months' growth the feathers are at their best, and in the case of the quill feathers, or long white ones, if left on the birds, even for a week or two longer, they begin to deteriorate. After six months' growth the blood vein in the quill dries up to the point where it enters the wing, and the quill can be cut through close to the wing without drawing blood, and without pain to the bird. This plan of cutting the quills is now invariably adopted. The short feathers—the black of the male and the drab of the female—are pulled, but they are allowed to have eight months' growth, and are, consequently, quite dry; pulling them does not injure the bird in any way, and they do not get damaged like the quill feathers by being left so much longer. When the quill feathers are cut the blacks or drabs, as the case may be, are pulled out. The stumps of the quill feathers are drawn out in two months' time. It would not be advisable to quill the birds should they get low in condition; it is better to wait until they start to pick up again, otherwise an imperfect plumage would certainly be the result. Begin to build up the condition of the bird a couple of weeks at least before the quills are drawn, and see that the bird is kept in good condition for the next four months at least, to ensure a good crop of feathers. Six months after quilling, another crop of feathers will be ready for clipping. The best implement for clipping the feathers is a pair of secateurs, and for pulling the quill stumps, a small pair of pincers.

The yard for taking the feathers should be erected in a position where access can be had to it from all the paddocks where the birds are running. The best form of yard is as follows:—The fence should be constructed of post and three rails. The area would be governed by the number of birds likely to be yarded—for 300 birds about a quarter of an acre is sufficient. At one corner erect a small yard, about 12 feet by 18 feet, made of hardwood posts with strong planks nailed across them, boarding it up to a height of 5 feet, leaving the bottom open for 18 inches from the ground; at one end have a wide gateway to admit the birds being driven in from the main yard, and at the other end a door about 3 feet wide for passing the bird through to the plucking box, which should be erected opposite the gate of the smaller yard. The box should be 22 inches wide, 3 feet deep, and 3 feet from front to back.

When the time for plucking arrives the mob is driven into the large enclosure, and from there the smaller yard is filled. Two pluckers then enter the yard and seize the nearest ostrich by the neck, and then slip a cap —made of thick cloth, shaped somewhat like a stocking—over the ostrich's

head. It is then pushed into the small box facing the door of exit, and one man standing on each side, it is soon divested of its feathers, entered on the tally sheet, and let out to meditate on the wonderful change in its appearance which has been effected in a few minutes. For the purpose of illustrating the mode of taking the feathers, we will suppose the mob of birds to be young ones, which have reached the age of 7 months, at which age the first crop of feathers is ready. The bird having been placed in the box, the first to be taken are the two rows of brown feathers growing along the wing and partly covering the long whites. These are pulled the whole length of the wing to the junction; next pull two rows of flossy feathers from the lower part of the wings. Afterwards the white feathers are cut, leaving about an inch of the quill protruding from the wing; never pull or cut the long, flossy feathers growing next to the bird's body behind the quill feathers; these add greatly to warmth of the bird, and are of little value. The tail feathers are next cut, and the operation is complete. As each bird is cut, an entry is made on a tally-sheet; and when the plucking of the lot is completed, an entry is made in a diary of the number, and an entry also in the diary two months' forward notifying at that date this lot of birds are ready to have their stumps pulled. When this interval has elapsed, they are then brought into the yard as for plucking and each bird passed through the box, the operator having a small pair of pincers, and, standing well behind the bird, pulls out the quills left in the bird at the time of plucking. The quilling of the mob completed, an entry in the diary is made of the number and date of quilling, and six months' forward an entry that on that date this mob is again ready for plucking.

There is no fixed time of the year for taking the feathers, and where a large number of birds are kept and young ones are constantly hatching out, there will be feathers ready to be taken almost every month in the year, for, at whatever time the chick is hatched, in seven months forward the first feathers are ripe, and at every recurring period of eight months another crop is ready for taking off. In plucking the feathers, care should be taken to tie up the different sorts in bunches as they are taken off the bird: this facilitates the next operation, that of sorting.

Sorting the Feathers.

In plucking the feathers, the wing feathers of the cocks and hens will have been tied in separate bundles, also the blacks, drabs, and tails of the respective sexes. These having been taken to the feather-sorting room, the sorter, sitting at a long table, will proceed first with cocks' white feathers, classifying them into heaps of four qualities—primes, firsts, seconds, and thirds, and one heap for tipped, that is white feathers with a black spot at the end. Then each of these heaps is sorted into lengths, having the feathers in each lot as near as possible the same length and quality. They should be then tied in bunches of 20 to 30 feathers of the longer ones in each bunch, and more of the shorter ones.

The fancy black and white feathers, called "byocks," should be sorted into two qualities, first and second. The hens' wing feathers are sorted into four heaps—white, light, and two shades of dark. These again are sorted, as with the whites. All broken or damaged feathers should be tied in bunches as a separate lot, as nothing tends more to depreciate the lot in the eyes of a buyer than to find inferior or damaged feathers stowed away in the bunches.

The different lots are weighed and entered on a sheet, each lot of feathers bearing a ticket, on which is shown the number of bunches comprising the lot and the weight.

Flour Paste as a Control for Red Spiders.

The United States Bureau of Entomology reports in Circular No. 166, the result of some experiments with flour paste as a control for red spiders, and also as a spreader for contact insecticides. Difficulty had been experienced in obtaining an effective spreader for lime-sulphur, and it was observed that a mixture of flowers of sulphur 15 lb., water 100 gallons, and paste (as a "sticker") 4 gallons, spread over the leaves very readily. It was accordingly mixed with lime-sulphur solutions, and the result was a smooth mixture that spread over the foliage very readily. Experiments showed that with 698 mites (red spiders) present, 99 per cent. were killed when the flour paste was used with the lime-sulphur spray, but that of 360 mites present, only 37·5 per cent. were killed by the spray when no paste was added. Further experiments showed that flour paste, 8-100 and 10-100 strengths, was effective against red spiders on hops, and from the encouraging results of other experiments with mites attacking pears it seems "very probable that flour paste, 8-100, will give good results when applied for any of the small leaf-feeding insects."

To prepare the paste mix a cheap grade of wheat flour with cold water, making a thin batter, without lumps: or wash the flour through a wire screen with a stream of cold water. Dilute until there is 1 lb. of flour to each gallon of mixture. Cook until a paste is formed, stirring constantly to prevent caking or burning. Add sufficient water to make up for evaporation.

It may also be prepared by stirring boiling water into a moderately thin batter, until there is 1 lb. of flour in each gallon of mixture, and allowing it to stand until the starch is all broken down.

If the paste is not sufficiently cooked the resulting spray will not be effective, and if over-cooked the paste will harden when thoroughly cool, and will not mix with water very readily. Usually, however, the paste is used as it is prepared, and over-cooking is not a disadvantage.

When mixed in the spray tank flour paste has a tendency to settle, and in order to do satisfactory work agitation is necessary. This is but a slight disadvantage, and is necessary with most materials.

First North Coast Egg-laying Competition.

A. H. HAYWOOD, Manager, and M. L. MYERS, Registrar, Grafton Experiment Farm.

As the result of representations made eighteen months ago by Mr. F. W. Collison, Maclean, Clarence River, through Mr. Briner, M.L.A., the Hon. the Minister for Agriculture, Mr. Treflé, approved of the first North Coast Egg-laying Competition being conducted at the Grafton Experiment Farm, upon lines similar to those carried out at the Hawkesbury Agricultural College.

It was intended that the Grafton competition should start concurrently with that of the College, but owing to such short notice this could not be arranged, and hence it was decided that the first competition should be a nine months' one only, commencing on the 1st July, 1912, and terminating on the 31st March, 1913.

The object of this competition, like that of kindred ones, was to demonstrate the importance of scientific breeding, proper feeding, housing, daily collecting, and the proper marketing of the eggs.

It was desirable that this should be done locally, in the midst of a large poultry industry, in order that the results obtained might be presented at first hand to the actual poultry farmers concerned.

The importance of the industry may be gauged from the appended statement, the figures being the latest available.

TABLE I.—Showing Poultry Statistics of the Counties of the North Coast for 1911.

	County Rous.	County Richmond.	County Clarence.	County Fitzroy.	County Raleigh.	County Dudley.	Total.
Fowls	157,444	37,093	135,489	28,947	43,489	32,096	434,558
Ducks	20,060	4,337	11,952	2,796	2,873	3,680	45,698
Geese	1,516	222	730	257	191	270	3,186
Turkeys ...	4,214	817	945	245	195	783	7,199
Guinea Fowls ...	280	55	410	221	104	58	1,128
	Doz.	Doz.	Doz.	Doz.	Doz.	Doz.	Doz.
Egg production..	529,461	175,964	668,748	116,105	112,979	111,304	1,714,561

In initiating the proposal, it was decided to enlist the co-operation of the agricultural societies of the Clarence River, and they were requested to nominate representatives for a committee of management.

The societies readily complied with the request; the Committee was duly constituted, and adopted rules for the governing of the competition. Following are the particulars of the Committee, and the rules as adopted:—

Committee of Management.

A. H. HAYWOOD, Manager, Grafton Experiment Farm; M. L. MYERS, Registrar, Grafton Experiment Farm, to act as secretary; E. T. BLAXLAND, H. G. MCKITTRICK, and P. C. SANDERS, representing the Clarence Pastoral and Agricultural Society; G. WINGFIELD, representing Ulmarra Agricultural Society; F. W. COLLISON, representing Lower Clarence Agricultural Society.

COMPETITION RULES.

1. The first competition to extend over the period from 1st July, 1912, to 31st March, 1913, inclusive. Competitors to deliver their birds at the Grafton Experiment Farm between the 24th and 29th June inclusive.
2. Each pen to consist of six pure-bred pullets, not less than seven months nor more than twelve months old on 1st July, 1912.
3. All birds to be bred by and to be the property of the competitor.
4. The Poultryman is empowered to reject any bird or birds that he does not consider of correct age. Any rejected birds must be replaced by the competitor with another bird of suitable age.
5. Upon the birds being accepted by the Poultryman as being of suitable age, no protest will be entertained upon that point.
6. Any bird found to be suffering from an infectious or contagious disease, when delivered at the Farm, to be rejected, and replaced by the competitor.
7. The Poultryman shall reject any bird on arrival that is not a fair specimen of the breed entered, and such bird must be replaced.
8. One wing of each pullet must be cut before forwarding to the Farm. The wing will be kept cut during the currency of the competition.
9. In the event of a bird dying, becoming diseased, incapacitated from laying, or developing vicious habits (such as egg eating or feather eating), the competitor must replace it with another of the same age and breed upon being notified. In the event of the owner failing to replace such bird within ten days of being notified, the Farm authorities are empowered to do so.
10. All eggs to become the property of the Department of Agriculture.
11. Eggs under 1½ oz. in weight or soft-shelled not to be counted.
12. Any pen, the eggs from which do not attain an average weight of 24 oz. per dozen before the expiration of the first four months of the competition to be ineligible for a prize.
13. The competition to be decided by the total number of eggs laid by each pen (subject to rules 11 and 12).
14. The market value of eggs from each pen to be recorded.
15. Records to be kept of the total quantities of the various foods consumed, and the average cost per head.
16. No competitor shall withdraw any bird until the termination of the competition.
17. Certificates to be issued to all pens laying 900 eggs during the competition.
18. Any competitor violating or failing to conform to these regulations will be subject to such disqualification as the Committee may think fit.
19. All prize money to be paid a fortnight after the termination of the period for which it was won, provided no protest be entered in the meantime.
20. The Committee's decision in all cases of dispute to be final.
21. Every competitor shall forward to the Manager of the Grafton Experiment Farm an entry fee of £1 on allotment of pen, otherwise the birds will not be accepted. Such fees to be devoted to the prize fund.
22. Competitors will be limited to those residing within the North Coast District from the Manning River to the Queensland border inclusive.

Value of Strain and Correct Breeding.

The winning pen of White Leghorns put up the remarkable score of 1,289 eggs for the period under review. The owner of this pen, Mr. L. J. O. Smith, of Byron Bay, secured this strain (Padman) prior to the many competition wins by Mr. Padman. Mr. Smith has consistently bred from trap-nested birds for some years past, and has well earned his success. It

is also significant that the second highest record was put up by a pen owned by Mrs. A. F. Wallis, Mullumbimby, of the same strain of Leghorns as the winners. She obtained her original stock from Mr. Smith.

This amply demonstrates that there is a lot in strain and correct breeding, and also that it is possible to maintain heavy laying characteristics for a number of years without sacrificing constitution. The birds in the winning pen went right through the competition without either death or replacement, and displayed every sign of unusual vitality.

Daily Collecting and Marketing of Eggs.

The rules of the competition, of course, necessitated the daily collecting of eggs.

All the competition eggs were shipped twice each week to Sydney, and sold on commission. They invariably realised "suburban" prices, whilst "Northern River" eggs were quoted from 3d. to 6d. per dozen lower, according to season. The following are actual returns for lines sold in Sydney on the dates mentioned:—

24th January, 1s. 5d.; 27th, 1s. 5d.; 31st, 1s. 7d.; 3rd February, 1s. 7d. per dozen.

The market quotations for "Northern River" eggs were:—

24th January, 1s.; 27th, 1s.; 31st, 1s. 1d.; 3rd February, 1s. 3d. per dozen.

The serious loss to the Northern River producer is accounted for chiefly by the fact that there is no daily collection of eggs, no suitable enclosures for the fowls (who have the run of the farm), and many eggs are not recovered from cane and corn crops before deterioration has set in.

Running the male birds with the hens is another contributing factor to quick deterioration, as fertile eggs will not keep as well as infertile ones.

As shown above, a direct gain of 10s. on a single case of eggs is no small item, and is sufficient warrant for producers to revise their methods.

System of Feeding.

The morning feed consisted of a mash of one part bran to three parts of pollard, mixed hot. Twice each week there was an addition of minced ox livers and the soup therefrom.

The evening ration was composed of equal parts of wheat and cracked maize. The allowance to each pen averaged about 1½ pints. In the winter the quantity of maize was increased and the wheat decreased. Chaffed green lucerne was fed at midday, and ground oyster shell was always available. Water was renewed twice daily in hot weather, and the water vessels swabbed out daily.

Size of Yards.

The size of each yard, as constructed, is 15 feet by 30 feet. The fences consist of 4 inch x 4 inch sawn hardwood posts, with 6 feet by 2 inch mesh wire-netting, threaded top and bottom with fencing wire. Coops are provided

for broodies. Houses, to serve two pens, are placed midway in each yard. The dimensions of these are :—Length 8 feet, depth 5 feet, height in front 5 feet, height at back 4 feet ; plates and studs are of 2 inch x 2 inch sawn hardwood. The roof is of galvanized iron. The houses are open-fronted, face the north-east, and admit the morning sunshine. They are limewashed inside and out. Ventilation is provided at top and bottom. Reasons of economy, and the theory that the size of pen used here is ample on our ground, account for their being somewhat smaller than those at other competitions.

Shade trees, one to each pen, have been planted, the Cootamundra wattle (*Acacia Baileyana*) being chosen on account of its quick-growing propensities.

Care of the Fowls.

Mr. J. Young, Poultryman, was responsible, under the direction of the Manager as the executive head of the Committee, for the care and well-being of the birds, and the results obtained speak for his capacity in that direction.

Expenditure.

All food supplies were purchased on the open market in Sydney, with the exception of maize and green feed, these being grown on the Farm.

The average of actual cost, including all freight charges, throughout the competition for the various commodities was as follows :—

Pollard, 1s. 5½d. per bushel ; bran, 1s. 6d. per bushel ; wheat, 4s. 3d. per bushel ; livers and shins, 4d. and 6d. each respectively ; oyster shell grit, 5s. 3d. per cwt.

The maize was charged at 3s. 9d. per bushel, being the average of the price of maize in the Sydney market, less 8d. per bushel, the actual ascertained cost of marketing. The green lucerne and rape was valued at 10s. per ton.

The total cost of feeding at the above rates was :—Wheat, £9 19s. 3d. ; maize, £13 2s. 6d. ; pollard, £12 9s. 9d. ; bran, £3 9s. 11d. ; livers, &c., £2 8s. ; green feed, £1 16s. : shell grit, £1 6s. 3d. ; total, £44 11s. 8d.

This works out at the average cost for feed per hen of 5s. 8d. for the nine months.

Revenue.

Every egg produced was marketed in Sydney, being sold, on commission, through Sussex-street houses.

The net amount realised, after deducting all shipping, cartage, and selling charges, was £107 6s. 5d., or an average of 13s. 9d. per hen for the nine months.

The excess over cost of feeding would thus be £63 4s. 9d., an average of 8s. 1d. per hen. This must be considered a very fair margin to cover cost of labour and interest on capital involved.

A table has been prepared showing the quantity of eggs marketed each month, and the "net" average price realised.

TABLE II.—Showing Number of Eggs Sold and Average Net Price Realised.

Month.	Number of Eggs sold.	Average "Net" Price realised.	Month.	Number of Eggs sold.	Average "Net" Price realised.
	dozen.	per dozen.		dozen.	per dozen.
July	136	1s. 3½d.	December ...	240	1s. 1d.
August	288	10¾d.	January	240	1s. 2½d.
September ...	240	9½d.	February ...	165	1s. 4d.
October	288	10d.	March	175	1s. 6½d.
November ...	264	11d.			

Taking the proportion of the whole consigned each month into consideration, it will be found that the actual value "on the farm" was 1s. 0½d. per dozen over the whole period under review.

The average cost of marketing a box of 24 dozen eggs, covering commission, shipping freight (including empty return boxes), wharfage, and cartage, amounts to 3s. 6d. This a somewhat heavier impost on the Northern River poultryman than that on his suburban confrère.

The records taken have also demonstrated the severe handicap the Northern River man is under in the matter of "breakages." Out of 76 consignments forwarded for sale, the agents reported "breakages" in 39 instances, ranging from ½ dozen to 5 dozen. Sometimes eggs that could be used were sold for a nominal price, but, generally speaking, the loss was a total one. When these eggs were selling at up to 2s. per dozen in Sydney, it can easily be seen that a considerable amount is involved.

In spite of expert and careful packing, and repeated representations to the shipping company, the item "breakages" recurs in the agents' accounts sales with almost monotonous regularity.

Comparison of Breeds.

It will be seen that most of the entries were for White Leghorns, and the results attained bear out the conclusion that the standard of this breed on the Northern Rivers is very high, and will bear favourable comparison with those elsewhere. The pens of the heavy breeds represented did not appear to attain to anything like the standard reached in the Leghorn entries, and for that reason comparisons have not been attempted, as they would be likely to prove misleading. It is expected that subsequent competitions will bring forward a much better representation of the heavier breeds.

The Prize List.

1. Greatest number of eggs in the nine months.—1. L. J. O. Smith, £5. 2. Mrs. A. F. Wallis, £4. 3. A. L. Gregor, £3. 4. G. D. Savill, £2. 5. D. McPhee, £1 10s.

2. Market value of eggs for the nine months.—1. L. J. O. Smith, £2 10s. 2. A. L. Gregor, £1 10s. 3. Mrs. A. F. Wallis, £1.

3. A prize of 10s. for the greatest number of eggs from a pen each month.—July: H. G. McKittrick, 10s. August, September, October, November, December, January, February, and March: L. J. O. Smith, 10s. each month, £4 in all.

The following competitors have gained certificates.—L. J. O. Smith, Mrs. A. F. Wallis, A. L. Gregor, G. D. Savill, D. McPhee, H. G. McKittrick, P. C. Sanders, W. E. Butters, H. M. Masters, Grafton Experiment Farm, Mrs. F. Leeson, Messrs. Hewitt and Harrison (White Leghorns), Messrs. Wingfield and Smith, T. T. Casey, H. J. Gulliford, J. A. Blanch, W. Lee, F. W. Collison, W. O. Gerard.

Special Prize of £5, presented by Mr. G. Varley, Proprietor of the *Clarence and Richmond Examiner*, for the pen laying the greatest number of eggs, and entered from the Clarence, Woolgoolga, Coff's Harbour, and Coramba Districts.—Mr. D. McPhee, Southgate.

THE DETAILED RETURNS.

Owner and Breed.	Eggs laid.									Total.	Weight per doz. of eggs.	Weight of birds on entering.	Weight of birds on leaving.	Deaths or replacements during Competition.	Market value of eggs.
	July.	August.	Sept.	October.	Nov.	Dec.	January.	Fe .	March.		oz.	lb.	lb.		s. d.
1. Smith, L. J. O., Byron Bay : White Leghorns	115	150	158	164	144	162	145	120	131	1289	25½	22	25	..	115 2
2. Wallis, Mrs. A. F., Mullumbimby : White Leghorns	70	144	145	141	140	135	129	104	99	1107	24½	24	27	1	97 2¼
3. Gregor, A. L., Byron Bay : White Leghorns	102	143	140	131	132	128	129	107	91	1103	26	22	23	1	97 7¼
4. Savill, G. D., Lismore : White Leghorns	94	138	130	123	118	133	126	97	101	1060	24½	24	26	2	94 5½
5. McPhee, D , Southgate : White Leghorns	76	122	127	145	111	125	134	117	100	1057	28½	28	27½	2	94 2¾
6. McKittrick, H. G., South Grafton : White Leghorns	126	148	143	136	127	106	120	69	74	1049	24½	21	21	1	91 7½
7. Saunders, P. C., Grafton : White Leghorns	91	136	137	149	126	137	117	86	63	1042	25	22	24	1	90 3¾
8. Butters, W. E., Coutt's Crossing : White Leghorns	105	141	143	143	104	99	124	95	80	1034	24½	24	26	..	90 11
9. Masters, H. M., Wyrallah : White Leghorns	100	135	126	142	132	127	124	89	52	1027	26½	26	27	..	89 1½
*Grafton Experiment Farm, Grafton : White Leghorns	83	137	141	147	120	123	101	87	82	1021	24½	22	23	..	88 10
10. Leeson, Mrs. F., Southgate : Brown Leghorns	72	140	140	137	98	120	110	104	79	1000	24	25	29	1	87 6¼
11. Hewitt and Harrison, Lismore : White Leghorns	44	126	133	131	134	126	122	104	75	995	25	20	25	..	86 7¼
12. Wingfield and Smith, Southgate : White Leghorns..	60	116	143	145	119	136	116	92	67	994	25	26	24	1	86 0
13. Casey, T. T., Maclean : White Leghorns	62	131	137	140	74	113	120	105	103	985	25½	22	27	2	87 7
14. Gulliford, H. J., Southgate : White Leghorns	65	111	131	140	112	111	117	90	81	958	25	25	25	..	83 11¼
15. Blanch, J. A., Woodford Leigh : White Leghorns	48	121	132	141	130	125	100	91	68	956	25½	28	28½	1	82 4½
16. Lee, W., Ulmarra : White Leghorns	80	124	136	146	100	90	110	82	64	941	25	25	29	1	81 8
17. Collison, F. W., Maclean : White Leghorns	58	121	130	143	107	121	90	90	61	921	25½	28	31	..	77 6¼
18. Gerard, W. O., South Grafton : White Leghorns	100	130	126	132	111	82	104	83	44	912	28	26	25	1	78 8¾
19. Parker, A. G., Lismore : Black Orpingtons	56	137	105	106	101	11	80	73	70	838	26	35	43	..	72 11¾
20. Crouch, A. C., Grafton : White Leghorns	78	124	125	108	85	81	103	71	47	822	27	24	26	..	71 6¾
21. Davison, C., Maclean : White Leghorns	51	108	130	116	87	101	81	56	64	794	24	28	29	..	68 2
22. Lindeman, H. W., Grafton : Silver Wyandottes	82	120	94	82	66	77	68	64	81	734	23	25	31	1	65 8½
23. Thompson, Mrs. M. K., Maclean : Silver Wyandottes	64	127	96	85	70	72	73	38	67	692	22½	27	32½	1	60 4
24. Hewitt and Harrison, Lismore : Silver Wyandottes	49	71	102	75	72	65	70	67	30	601	22½	28	31	1	51 10¼
25. Thompson, J. A., Maclean : Minorcas..	6	80	106	103	68	40	52	26	14	495	26½	28	35	..	39 3½
Totals	1946	3281	3356	3351	2788	2845	2765	2207	1888	24427	..	..	..	18	....
Average per hen per month	12·5	21	21·5	21·5	17·9	18·1	17·6	14·1	12·1	..	..	..	..	..	....

* Non-competitive as regards prize money.

Net Values of Eggs for Each Month.

Owner of Pen.	Breed of Fowl.	Value of Eggs for Month of —								Total Value.
		July.	August.	September	October.	November	December.	January.	February.	March.	
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1. Smith, L. J O.	White Leghorns	12 4¼	11 1½	10 4¾	11 4¾	11 0¾	14 7	14 6	13 0	16 9¾	115 2
2. Gregor, A. L.	,,	10 11½	10 7¾	9 2½	9 0¾	10 1½	11 6¼	12 10¾	11 7	11 8¼	97 7¾
3. Wallis, Mrs. A. F.	,,	7 6¼	10 8¼	9 6¾	9 9	10 8¾	12 1¾	12 10¾	11 3	12 8½	97 2¾
4. Savill, G. D.	,,	10 1¾	10 2¾	8 6¾	8 6	9 0½	11 11¾	12 7	10 6	12 11½	94 5½
5. McPhee, D.	,,	8 2	9 0½	8 4¼	10 0¼	8 6	11 3	13 4¾	12 8	12 10	94 2¾
6. McKittrick, H. G.	,,	13 6½	11 0	9 5	9 5	9 8¾	9 6½	12 0	7 5¾	9 6	91 7½
7. Butters, W. E.	,,	11 3½	10 5½	9 5	9 10¾	7 11¾	8 11	12 4¾	10 3½	10 3¼	90 11
8. Sanders, P. C.	,,	9 9½	10 1	9 0¼	10 3½	9 8	12 4	11 8½	9 3¾	8 1	90 3¾
9. Masters, H. M.	,,	10 9	10 0¾	8 3½	9 9½	10 1¾	11 5¾	12 4¾	9 7¾	6 8	89 1½
— Grafton Experiment Farm	,,	8 11	10 2	9 3½	10 2	9 2½	11 0¾	10 1	9 5	10 6¼	88 10
10. Casey, T. T.	,,	6 8	9 8½	9 0¼	9 8¼	5 9	10 2	12 0	11 4½	13 2½	87 7
11. Leeson, Mrs. F.	Brown Leghorns	7 9	10 4½	9 2½	9 5¾	7 6¼	10 9½	11 0	11 3	10 1¾	87 6¼
12. Hewitt and Harrison	White Leghorns	4 8¾	9 4¼	8 9	9 0¾	10 3¼	11 4	12 2½	11 3¼	9 7½	86 7¼
13. Wingfield and Smith	,,	6 5½	8 7¼	9 5	10 0¼	9 1½	12 2¾	11 7	9 11½	8 7¼	86 0
14. Gulliford, H. J.	,,	6 11¾	8 2¼	8 7½	9 8¼	8 7	9 11¾	11 8½	9 9	10 4¾	83 11¼
15. Blanch, J. A.	,,	5 2	8 11¾	8 8¼	9 9	9 11½	11 3	10 0	9 10¼	8 8¾	82 4½
16. Lee, W.	,,	9 6¾	9 2¼	8 11½	10 1¼	7 8	8 1¼	11 0	8 10½	8 2½	81 8
17. Gerard, W. O.	,,	10 9	9 7¾	8 3¼	9 1½	8 6	7 4½	10 4¾	9 0	5 7¾	78 8¾
18. Collison, F. W.	,,	6 2¾	8 11¾	8 6¾	9 10¾	8 2½	10 10¾	7 2	9 9	7 10	77 6¼
19. Parker, A. G.	Black Orpingtons	6 0¼	10 2	6 11	7 4	7 9	9 10¾	8 0	7 11	8 11¾	72 11¾
20. Crouch, A. C.	White Leghorns	8 4½	9 2¼	8 2¾	7 5¾	6 6¼	7 3½	10 3½	7 8	6 0¼	71 0⅝
21. Davison, C.	,,	5 5¾	8 0	8 6¾	8 0¼	6 8	9 1	8 1	6 0¾	8 2½	68 2
22. Lindeman, H. W.	S. L. Wyandottes	8 9¼	8 10¾	6 2¼	5 8	5 0¾	6 11½	6 9½	6 11¼	10 4¾	65 8½
23. Thompson, Mrs. M. K.	,,	6 10½	9 5	6 3¾	5 10½	5 4½	6 5¾	7 3½	4 1¾	8 7¼	60 4
24. Hewitt and Harrison	,,	5 3	5 3¼	6 8½	5 2¼	5 6¼	5 10¼	7 0	7 3	3 10¼	51 10¼
25. Thompson, J. A.	Minorcas	0 7¾	5 11¼	6 11¾	7 1½	5 2½	3 7¾	5 2¼	2 9¾	1 9½	39 3½

Rhodes Grass.

E. BREAKWELL, Economic Botanist.

THE drought-resisting qualities of Rhodes grass have been further demonstrated by experimenting with it at Nyngan.

The seed was sown in August, 1912. Beyond cultivation for sowing no other care was taken. The rainfall from 1st September, 1912, to 31st January, 1913, was 2·9 inches, very much below the average. In spite of this Rhodes grass not only remained green, but made good growth, and at the end of January was in a very flourishing condition. The photograph shows how this grass adapts itself to the dry western conditions.

The writer had also the opportunity of seeing Rhodes grass at the home of Mr. Sylvester Browne, Minembah, to whom New South Wales is indebted for its introduction. It was at the end of a very dry season (January, 1913), and while most of the native grasses were completely withered and parched, Rhodes presented a remarkable green appearance, and was much appreciated by the sheep on the estate.

How much stocking this grass will actually stand under such conditions has yet to be shown.



Rhodes Grass at Nyngan Experiment Farm after a very dry period.

Score Card.

For Judging Green Wheat Fodder.

The following Score Card is recommended by Mr. R. N. Makin, Inspector of Agriculture for the South Coast, for adoption in the forthcoming green fodder competition at Dapto.

It is anticipated that the card will be of assistance to judges in making awards in connection with competitions in the growing of wheat for green fodder.

1. Suitability of variety for green feed	15
2. Stooling capacity	15
3. Condition of ear	10
4. Percentage of leafiness	10
5. Freedom from disease	15
6. Freedom from weeds	15
7. General appearance	10
8. Period of maturity	10
	100

9. Yield: 1 point for every cwt. of green feed.

Remarks.

1. In a fodder crop for dairy cattle, quality, earliness and disease-resistant properties must be taken into consideration.

2. Stooling habits are desirable characteristics in wheat for green fodder. As some naturally stool better than others, allowance must be made.

3. The greatest amount of nutriment is in the plant at the time when the grain is changing from the milky to the doughy stage.

4. The percentage of leafiness is a most important point.

5. Freedom from rust, smut, mildew, &c., and insect troubles.

6. This speaks for the preparation of the seed beds.

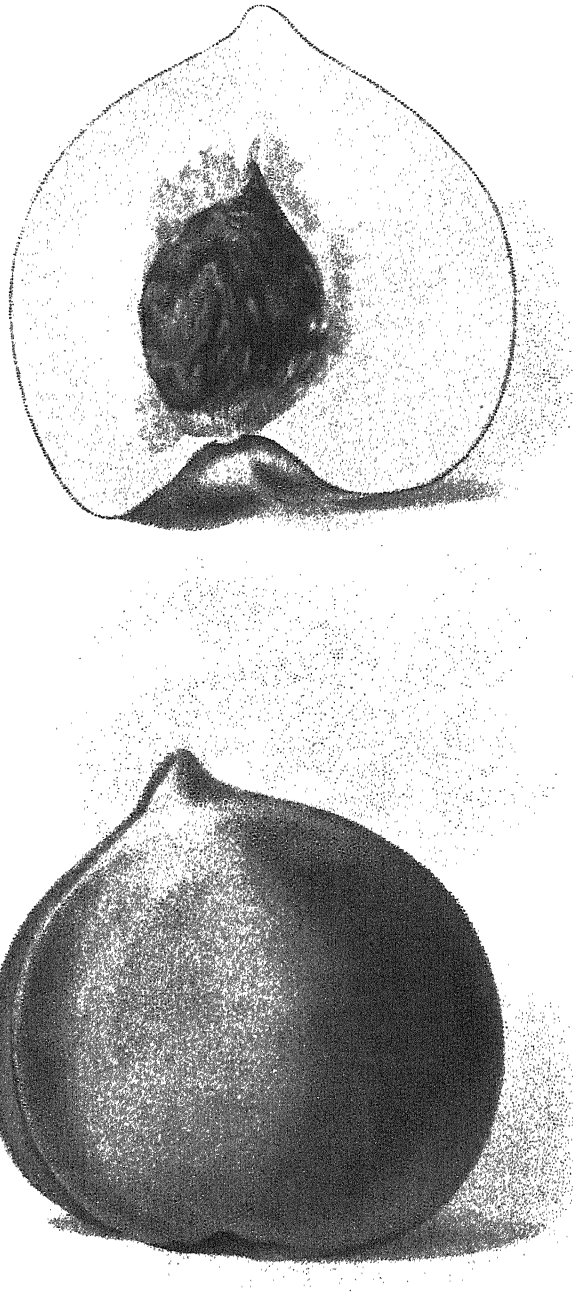
7. Evenness of growth of crop, colour, &c.

8. Time occupied in the growth of the crop.

9. Yield per acre to be taken by cutting out a section to be agreed upon between exhibitor and judge, say, 8 ft. 3 in. x 16 ft. 6 in., weighing and averaging.

The Admiral Dewey Peach.

Fruit, medium size, roundish; skin, yellowish, with bright red on the sunny side; flesh, yellow, firm, subacid; quality good, freestone; growth of tree, strong. This peach ripens early in January at the Hawkesbury Agricultural College orchard. It is one of the most promising of the early yellow-fleshed peaches.



Malt Sprouts.

A correspondent asked for an analysis of "malt-culmings," and also whether they formed an egg-producing or a fattening food for poultry.

In his reply Mr. F. B. Guthrie said: Malt combings, malt culmings, malt sprouts or barley sprouts are all different names for the same thing. Perhaps it would be best to use the one name "malt sprouts" in all cases. The barley when on the malting floor is moistened and warmed until the shoots are about an inch long. The temperature is then raised sufficiently to cause the shoots to wither, when they are readily brushed off, and constitute the malt sprouts.

Analyses of samples examined in the laboratory are as follow:—

	Barley Sprouts.	Malt Culmings.
Moisture	11·42	8·31
Ash...	5·37	6·67
Ether Extract ...	0·21	0·30
Fibre	14·61	13·40
Albuminoids ...	21·71	24·50
Carbohydrates ...	46·68	46·82
	100·00	100·00
Nutritive value ...	68·9	71·9
Albuminoid ratio	1 : 2·2	1 : 1·9

The names given are those under which the samples were submitted for analysis. It will be seen that they form a concentrated and highly nitrogenous food. They are used extensively for feeding in America and Europe, and if obtainable at a reasonable cost make a very valuable addition to the ration. They are much more nitrogenous, and the albuminoid ratio much narrower, than any of the more common concentrated foods, the only fodder which approaches it in this respect being lucerne hay. They contain less fibre than lucerne hay, and their value is about midway between this and bran or pollard. They contain more fibre than bran or pollard and much less fat. They are deficient in fat, and should be supplemented in a ration by oil cake.

A recent issue of the *Journal* of the Department of Agriculture and Technical Instruction for Ireland states that "malt coombs," as they are called there, are rich in albuminoids, and contain a considerable portion of the nitrogen in the amide form. They can be used as part of the foods for most farm stock, and are specially suited for dairy cows. They require to be well soaked before using.

A Chicken Mixture.

In reply to a correspondent as to a suitable chicken mixture, Mr. D. S. Thompson, Poultry Expert, Hawkesbury Agricultural College, recommends the following, which can easily be made by every poultry farmer for himself:—Equal parts of cracked wheat, cracked maize, bran and pollard, to which is added one-tenth of its weight of fine sea shell grit.

The Branding of Australian Hides.

Some reports relative to the present method employed in Australia in the branding of hides and skins have been received by the Commonwealth Government from the United Tanners' Federation of the United Kingdom and the editor of the "Australian Leather Trades Journal," and copies have been received by the Minister of Agriculture (Hon. J. L. Treflé, M.L.A.), through the State Premier, from the Honorable the Prime Minister of Australia.

The United Tanners' Federation deprecates the use of hot irons by farmers and breeders, and points out that the damage caused, and economic waste brought about, by such a crude and unnecessary procedure is enormous.

They state that the difference in price obtainable for the *tanned* leather, were it not branded, is probably 3d. to 4d. per lb.

Then, again, *raw* hides, if not branded, would fetch 1d. per lb. more, and as these hides weigh from 60 to 80 lb. the difference in value is very appreciable.

The Federation advocates either an alteration of the method of branding, or that the animals be branded with smaller brands, on the cheeks, ears, or flanks—not on the rump, or the back, as is at present nearly always done. They consider that this would be equally distinguishable, and would do from 5s. to 7s. per hide less damage to a beast, as the brands would then be on leather, which, in the open market, is only worth from 7d. to 9d. per lb. In other words, the brand would be on the thinner, and, therefore, less valuable part of the hide.

The "Australian Leather Trades Journal" also urges that some steps be taken for the amelioration of the great financial loss occasioned owing to the improper branding of hides and skins. This journal has drawn attention to the following extract from a leading article, headed "Hide and Skin Buyers' Unrest," which appeared in the British "Leather Trades Review," of 20th November last:—

> In Australia some of the finest hides in the world are badly damaged while on the animal's back, by the barbarous system of branding with hot irons, which are generally stamped on the primest parts. Here, again, tanners have been agitating for many years to get the evil removed or mitigated, but until quite recently little attention has been paid to their requests. Now that the United Tanners' Federation of Great Britain and Ireland have called the attention of the Australian Government to the serious loss caused by the present system of branding, it is expected that an improvement will soon be effected. It seems so stupid to pursue such a shockingly wasteful method of marking hides, when there are any number of chemists who could prepare an indelible solution, which would not only do no injury to the hide, but would also stand out even more prominently on the animal's back than the marks produced by the present system of branding.

Killing Blackberries.

The method recommended is to dissolve 1 lb. of arsenic and 1 lb. of washing soda in 2 gallons of water, and make up when cold to 8 or 10 gallons. If the plants are broken or cut near the roots, the effects will be more rapid. The plants may probably require a second application of the spray.—Geo. Valder.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS.

Branch.	Honorary Secretary.
Albury	Mr. J. D. Lankester, Albury.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Beckom	Mr. S. Stinson, Beckom.
Bonville	Mr. H. B. Faviell, Bonville.
Borambil	Mr. H. A. D. Crossman, "Homewood," Quirindi.
Bungalong	Mr. E. Hughes, Oakleigh, Cowra Road, *viâ* Cowra.
Cardiff	Mr. F. B. Cherry, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Collie	Mr. C. J. Rowcliff.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coreen-Burraja	Mr. Wm. Stodart, Coreen, *viâ* Corowa.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Deniliquin	Mr. W. J. Adams, jun., Deniliquin.
Derrain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Erudgere	Mr. Frank Hughes, Erudgere.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. Duffy, Henty.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit, via Manilla.
Kellyville	Mr. C. F. Boughton, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Portland	Mr. W. C. Gambrill, Lower Portland.
Mangrove Mountain ...	Mr. G. T. Hunt, Mangrove Mountain, *viâ* Gosford.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Moruya	Mr. P. Flynn, Moruya.
Narrandera	Mr. C. F. Pearce, Narrandera.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
New Italy	Mr. F. A. Morandini, New Italy.
Nimbin	Mr. J. H. Hutchinson, Nimbin.
Orangeville	Mr. C. Duck, Orangeville.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose-Kareela	Mr. L. Pieremont, "Vila," Penrose.
Redbank	Mr. J. A. Graham, Woodlands McAlister, via Goulburn.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria streets, St. Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Stockinbingal	Mr. J. Neville, Stockinbingal.
St. John's Park	Mr. A. King, St. John's Park.
Tallawang	Mr. J. E. Hansall, Tallawang.
Taralga	Mr. Dave Mullaney, Stonequarry, Taralga.
Toronto	Mr. J. G. Desreaux, Esmond, Toronto.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.

Branch.	Honorary Secretary.
Walli	... Mr. A. V. Bloomfield, Walli.
Wallendbeen ...	... Mr. W. J. Cartwright, Wallendbeen.
Wetherill Park ...	... Mr. L. Rainbow, Wetherill Park.
Wolseley Park ...	... Mr. H. McEachern, Wolseley Park.
Wyan	... Mr. C. W. Harper, Myrtle Creek Railway Station.
Wyong	... Mr. Edgar J. Johns, Wyong.
Yass	... Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the Branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Demonstrations in Clearing Land and Subsoiling with Explosives.

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. H. C. Coggins, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Bee-keeping.

A series of lectures on bee-keeping is being arranged by Mr. R. G. Warry, Instructor in Apiculture. Secretaries, whose branches intend availing themselves of this opportunity to receive a practical insight into this branch of agriculture, are requested to make early application.

NOTES AND REPORTS FROM BRANCHES.

Albury.

Mr. J. G. R. Bryant, Assistant Fruit Expert, will visit Albury on the 25th June for the purpose of giving a pruning demonstration, and advice in matters pertaining to orchard work.

Blue Mountain.

A demonstration in clearing and subsoiling with explosives is in course of arrangement. The demonstrator is Mr. H. C. Coggins, Assistant Inspector of Agriculture.

Deniliquin.

The usual monthly meeting was held at the School of Arts on 23rd April, when Mr. W. J. Adams, Honorary Secretary, read a paper on "The necessity of supplying wheat lands in the Deniliquin district with humus."

Mr. ADAMS said that a farmer must regard the soil as his chief asset, he must regard it as a bank from which certain amounts can be drawn only if certain deposits are made. While new land is comparatively rich in humus, the paddocks which have been cropped for some years are showing unmistakable signs of being depleted of this most important constituent in the soil matter. The need for the introduction of organic matter was pointed out, especially in the case of sandy soils which require binding together in order that capillarity may be established. Most of the plant-food in the soil exists in an insoluble condition, and is made available very slowly. Organic matter, *i.e.*, humus, helps to make the insoluble ingredients valuable, so that plants may make use of them. As an instance, it was pointed out that, though an average soil in the district contains in the first 12 inches several tons of nitrogen, phosphoric acid and potash, and that a 20 bushel crop of wheat only uses 35 lb. of nitrogen, 14 lb. of phosphoric acid, and 25 lb. of potash, still in the case of phosphoric acid there is not sufficient present in an available form to supply this 14 lb. That such is the case is amply demonstrated by the increased yields obtained by applying about 56 lb. of superphosphate to the soil at time of sowing seed. Farmers present were exhorted to replenish their soils in humus, by growing fodder crops and ploughing-in the stubble.

Erudgere.

A branch of the Bureau has been formed at McDonald's Creek, Mudgee. The office-bearers elected for the ensuing year are:—Mr. A. McDonald, Chairman; Mr. J. Hill, Vice-Chairman; Mr. R. McDonald, Honorary Treasurer; Mr. Frank Hughes, Honorary Secretary.

Gerringong.

Mr. C. J. Sanderson, M.R.C.V.S., Government Veterinary Surgeon, gave the opening lecture to members of this branch on 27th March. The subject was "Abortion and Mammitis in Cattle." The attendance numbered 50, and at the conclusion of the lecture many questions were asked and satisfactorily answered. A vote of thanks was accorded Mr. Sanderson.

Grenfell.

A lecture on veterinary subjects has been arranged by Mr. H. O. Oliver, M.R.C.V.S., Government Veterinary Surgeon, for the 10th June.

Gunning.

Arrangements are being made for a lecture and demonstration by Mr. J. G. R. Bryant, Assistant Fruit Expert.

Henty.

In accordance with arrangements, Mr. J. W. Mathews, Sheep and Wool Expert, visited Henty on the 10th and 11th April, for the purpose of lecturing on the blow-fly pest, and of dealing with the question of sheep-breeding under local conditions.

THE BLOW-FLY PEST.

Mr. Mathews arrived on the evening of the 9th, and spent the following day inspecting flocks and interviewing farmers with the object of ascertaining what they were doing with sheep in connection with wheat-farming.

In the evening he delivered a lecture illustrated with lantern views, outlining the most suitable combinations of breeds for the farmer who used sheep as an adjunct to wheat-farming.

Dealing with the blow-fly pest, Mr. Mathews outlined the scheme which the Department proposed carrying out for coping with the pest.

In addition to the course proposed by the Government Entomologist, whereby the destruction of the fly will be made the main objective, the proposal to carry out the testing of various specifics at the different Experiment Farms was outlined. This will embrace the erection of dips and a systematic and regular form of treatment in which dipping, crutching, and spraying is to be conducted, and carried out during the seasonable months of the year, and at periods when the fly usually proves most troublesome.

Dipping.—Dipping should be done about six weeks after shearing. The dimensions of a dip, and the time during which the sheep should be immersed in the solution, was stated as not less than a minute in the dip, and a length of swim of not less than 60 feet. Should the dip be shorter, the sheep should be checked so that they will not leave the water before the time specified.

Crutching.—In order to guard against affection, breeders were advised to crutch as soon as the wool reached a fair length, preferably in the autumn. Attention was drawn to the extent to which crutching should be done. It should be confined to that part of the body extending on the inside of the legs to the hocks, thence along back of the legs to the thighs, and so across the stern to the region of the root of the tail. Extreme care was necessary when the operation was performed on ewes that had reached an advanced stage of pregnancy. If it can possibly be avoided, ewes in this condition should not be crutched at all, but should occasion arise to render the operation necessary it should be performed with the ewe standing in a natural position. Frequently the fœtus was displayed and much trouble experienced at lambing time owing to the knocking about and the turning over that was unavoidable when crutching had been delayed beyond the earlier periods of gestation. The assistance of somebody holding the sheep firmly by the head would greatly facilitate in clipping the wool from the affected parts when standing upright. The use of the machines for crutching was preferred to ordinary blades, and it would be well, in view of the value of the crutch wool, to have, if possible, the work conducted in a shearing shed or on a platform board properly constructed for the purpose. Should the sheep be badly affected, and treatment be necessary away from the sheds or means of convenience, the precaution of not allowing the maggots to escape from view might be taken by having crutching done on a sheet of iron, bags, or something else of the sort. Even the maggot-infested wool has a market value, and growers should see that it was in the best condition possible before sending it to market. If allowed to remain some time where the sheep were shorn, the maggots would leave the wool and crawl to the bottom. Any left in the wool might then be shaken out, the wool gathered, taken to the shearing shed, and dried before packing. In all cases the maggots should be burnt. The affected parts should then be dressed with a suitable specific. For swabbing it was difficult to recommend any particular preparation that would prove more efficacious than another. Under certain conditions various specifics had proved satisfactory, while at a subsequent date they had not prevented reinfection. The lecturer stated that from his experience an arsenical dip, properly prepared and manufactured by recognised chemical proprietaries, was the most satisfactory. It should be used in double the strength that would be used for ordinary dipping purposes. A 10 lb. packet of the ordinary powder should be added to 60 gallons of water, as against a similar quantity used for 120 gallons of water for ordinary dipping.

Spraying.—Spraying should in most cases follow crutching, but it had been found by breeders situated in districts where flies had proved extremely troublesome, that spraying would at times ward off the attacks of the pest without any additional treatment. Generally speaking, however, the best precautionary measure had proved to be a combination of spraying and crutching. The application of the spray should be effected by first driving the sheep into the yard, and then into a race, where they should be treated singly and in turn, the solution being applied from the rear by the aid of a powerful spray pump, by forcing it well into the crutch of the sheep and around the hinderpart, until the wool became thoroughly saturated.

Spraying could be done at any time throughout the year, but it should be understood that, whilst in many cases good results had been obtained from spraying, it should not

by any means be held as a substitute for dipping. As in a case of swabbing, an arsenical dip should again be used of double the strength that is used for dipping, because while the arsenic remained in the wool or on the skin all maggots must be killed, which would otherwise mature and eat into the flesh.

To prevent increase.—The general consensus of opinion was that the blow-fly was a legacy of the rabbit, due to enormous numbers of carcases being allowed to decompose in the open, thus causing a rapid multiplication of the fly. The laying down of poison baits also caused the destruction of bird life, which if otherwise preserved would have kept the fly in check. Every settler could assist in the reduction of the pest by immediately burning or burying any animal that died on their property. They might also consider the advisability of adopting other and better methods for the extermination of the rabbit than the spreading of poison such as would kill or destroy the insectivorous birds.

Particulars concerning the cross-breeding, and the types specified for the locality were given, but are held over till the next issue of the *Agricultural Gazette*.

At the conclusion of the lecture it was arranged that another visit be paid to Henty for the purpose of inspecting additional flocks, and to give a demonstration with wool, respecting its growth and classification. It was also proposed that an officer of the department should remain in the district at shearing time for a few days, to visit the farms during the progress of shearing in order to tender advice and give instruction on the breeding and classification of members' flocks and herds.

Inverell.

Mr. J. W. Mathews, Sheep and Wool Expert, has arranged to inspect members' flocks on the 4th and 5th June, for the purpose of giving advice generally. On the evening of the 5th, Mr. Mathews lectures on "Sheep and Wool."

Mixed Farming.

In a paper on this subject at the April meeting, Mr. J. Ditzell pointed out the worth and stability of the Inverell district for mixed farming. The rainfall, soil, and climate were all that could be desired, but the factor which had retarded progress was the want of railway communication with the natural markets. Direct railway communication would advance the district by leaps and bounds.

It was not wise to put all one's eggs in one basket. There were many branches of agriculture, including live-stock raising (horses, cattle, sheep, and pigs), crop-growing, dairying, fruit and vegetable culture, &c., and it was for each farmer to determine which branches were most suitably adapted to his own particular surroundings. In connection with crop-growing, one of the most material problems in Australia was to bring about a system of farming that would maintain or increase the productive powers of the soil. The rotation of crops was a cardinal principle. Different classes of crop removed from the soil plant-food constituents in different amounts. When one variety of crop was grown continually on the same land, the food supplies for that crop become diminished, thus lessening the yield and quality. Recent scientific discoveries indicated that toxic substances were produced in the soil by plants, and as these accumulated they became harmful to the particular crop producing them. The remedy was the rotation of crops. Certain compounds discarded by one plant were frequently utilised by others, hence a tendency to maintain soil fertility. The pasturage for live-stock on the farm was changed, and a variation of food grown. Insect and fungus pests were also kept in check by changing the locality of the affected crop. Rape, which was liable to aphis, grown continually on the same ground became more affected each year. Wheat, susceptible to take-all, likewise had a tendency to become more affected if continually grown on the one area. A rotation of oats would more or less starve out the fungus. Conditions modifying the rotation of crops were: Distance from market, class of stock kept, climate, and market values of the various crops. Crop-growing, especially wheat and similar cereals, should go hand in hand with stock-raising, especially sheep. When sheep were kept on the farm, they were useful for eating off the wheat crops that were too forward, and, being small animals, they did not trample the ground too much, providing it was fairly dry.

Sheep converted into mutton and wool the weeds which grew on ploughed land which might be termed fallow, especially if the land had been ploughed for any time. The great aim should be to maintain the fertility of the soil. A good practice was to endeavour to get the largest amount of plant-food from the soil, for by so doing large crops were obtained; but no less important was the turning under of crop residues, and so far as was necessary the introduction of commercial fertilisers.

In connection with the general principle of manuring, the three main plant-foods required were nitrogen, potash, and phosphoric acid. Lime was also important, not so much as a direct plant-food, but for its powers of rendering clayey soils pliable and sandy soils compact. It neutralised or sweetened acid soils, assisted the action of beneficial bacteria, liberated a portion of the potash in the soil, checked the invasion of plant diseases, and was of especial benefit to legumes. On soils requiring lime, from half to two tons might be applied. Either slaked or quicklime would do, but the action of the latter was more pronounced.

Nitrogen was a valuable constituent, but on account of local conditions favouring nitrification (the production of nitrates by the action of beneficial bacteria), it was seldom necessary to apply it to other than sandy soils. Manures which supplied nitrogen were sulphate of ammonia, dried blood, bones, guano, and nitrate of soda. The best method of applying nitrogen to the soil was to grow leguminous crops in rotation with others. Legumes contained small colonies of bacteria on their roots, forming nodules or warty excrescences, and whilst the bacteria lived on sugar, &c., secreted by the plant, they in turn took in nitrogen from the soil air; so that the plant was not compelled to draw much upon the nitrogen content of the soil, and where the plant roots decayed, the soil was enriched with nitrogen. The necessity of including legumes in the rotation of crops was therefore increased.

Potash entered chiefly into the straw and stalk, and it was advisable to return as much to the soil as possible in the form of wheat stubble, cornstalks, &c. Local soils were in most instances rich in potash, and it was only the naturally poor soils that needed much addition. Sulphate of potash was a manure that supplied potash.

Phosphoric acid, while favouring root-growth in the early stages, entered chiefly into the formation of the head later, hence when the grain was removed the manure was also. Phosphoric acid was an ingredient that required to be added. Superphosphates were almost universally used in the Central, Western, and Riverina districts, and their application to lighter soils and worn-out areas would result in increased yields. Any sceptical farmer would be astonished at the result of an experiment on portion of his crop. No matter how fertile the soil was, continual cropping always tended to impoverish it. Chemical analysis was really an inventory of the soil, determining the plant-food elements in hand, and as such it was very valuable.

Keepit.

The annual meeting of this branch was held on the 12th April, when the previous office-bearers were re-elected for the ensuing year.

Mr. A. H. E. McDonald, Inspector of Agriculture, who delivered an instructive lecture during March, was again present to advise members regarding the results from the wheat experiment plots in the North and North-western districts.

A useful discussion followed, in which members present took part. Various speakers, basing their remarks on personal experience, gave information as to various methods of culture and varieties of wheat that had proved successful or otherwise in the district.

Kellyville.

A pruning demonstration will take place at Kellyville in the orchard of Mr. C. F. Boughton, honorary secretary of the branch. Mr. J. G. Bryant, Assistant Fruit Expert, will be the demonstrator.

The usual monthly meeting was held in the Public School on the 5th April. There was a very good attendance of members. Mr. T. Hewson

was present, and addressed the meeting on "Co-operative Methods," and gave an outline of what the Fruit-growers' Co-operative Association were doing for the benefit of fruit-growers. At the close of the address promise of support was given in that direction, and a vote of thanks accorded the speaker.

Arrangements are being made for a large party of orchardists to visit the Hawkesbury Agricultural College at an early date.

Leech's Gully.

A circular letter issued by the Inverell branch of the Agricultural Bureau was discussed by the members at Leech's Gully at the last meeting. The letter dealt principally with the question of railway freights in connection with agricultural machinery, and a co-operative endeavour is to be made to have freights reduced in the future.

The International Harvester Company was approached to give a demonstration with their new corn-pulling machine.

Mangrove Mountain.

The first annual meeting of this branch was held on the 19th April. The office-bearers, who held office last year, were reappointed for the ensuing year.

A paper was read by Mr. Harold Robinson, of which the following are some of the salient features :—

Citrus Culture.

Perhaps the best land for citrus trees is the sandy loam, with a depth of 2 to 3 feet and gravelly subsoil. Where lacking in humus, legumes and green crops are recommended for green manuring. This class of ground holds the moisture and is easily kept clean.

Common lemon and orange stocks are generally used. The lemon is a good forager in shallow soils, and is mostly used in the coastal district. Orange stocks are deep feeders, and are recommended for alluvial flats. For special varieties of navel oranges, I recommend for this district the "Trifoliata" or Japanese Dwarf stock.

The planting board is much more accurate than the old way of sighting. A mound of dirt or a flat stone should be placed in the hole to spread the roots. Stakes should not be allowed to remain as they attract white ants, dry rot and gumming.

The spray pump is very effective on young trees, but fumigation is strongly recommended when trees are big and of thick foliage.

Where water can be conserved, irrigation is of immense value. Water should be confined to channels.

August, November, and March are the best months for manuring citrus trees.

The Dutch hoe is found useful under big trees, where the prong hoe cannot be easily worked. The rows can be worked by the cultivator.

Fruit should be carefully handled and kept out of the sun ; should be well and evenly graded, and the case branded according to quality.

Narrandera.

After the ordinary business was concluded at the last monthly meeting of of this branch, several interesting papers were read.

The first was by Mr. George Hopwood, who gave a short address on the subject of "Thatching Stacks." He described how the work had been done on his father's farm for some years.

The address was listened to with interest, and a vote of thanks was passed to Mr. Hopwood for his effort.

Mr. J. Faulkner, Stock Inspector, read a paper that proved instructive, of which the following is an abbreviated report:—

VETERINARY POST MORTEMS.

The purpose of the present paper is to impress upon the attention of the stock-owners the importance of a careful investigation into the circumstances surrounding every case of disease or death that may occur amongst their stock. Unfortunately, all farm animals, and particularly the most highly bred and valuable ones, are extremely susceptible to disease and premature death. The annual loss on any farm of average extent due to premature and probably avoidable deaths amongst the stock, is often a weighty item. It is remarkable, too, what a large percentage of the deaths are the result of causes which are very vaguely understood or altogether unexplained. If the owner, in every case of unaccountable death of an animal, would take the trouble to make a thorough and intelligent examination of all the circumstances, the knowledge gained would often prove very useful to him in subsequent cases. I shall confine my remarks in the present instance to the consideration of post-mortem appearances observed in the carcases of animals that have succumbed to some obscure disease or other unknown cause. To be in a position to make an intelligent search for some morbid peculiarity, it is not necessary that a knowledge of the appearance of the various organs of the animal body when in a normal condition should always be of a precise scientific or professional character. Nearly every farmer can acquire much of the necessary knowledge of animal anatomy in the school of nature itself, when acting as his own butcher. Armed with knowledge gained in such a manner, the stock-owner would often be able to locate the seat of trouble in a diseased carcase under examination. In this way the death of the animal might often be traced to some cause of a really simple kind, which could be brought under such control as to remove the danger from other animals. I find that there is frequently a very decided reluctance on the part of the average man on the land to undertake the work of dissecting a carcase, but when the first feeling of repulsion is overcome the work becomes not only unobjectionable, but extremely interesting and instructive. No doubt, the objection to handling a diseased carcase is very often due to the risk that exists in certain diseases (such as anthrax), but I might point out that in cases where anthrax is suspected, it would be advisable not to attempt any detailed work of dissection at all. The condition of the spleen, or melt, is recognised as the diagnostic symptom in a death from splenic anthrax. This organ can easily be exposed and examined without making any extensive dissection of the carcase. If the dead animal is placed on its right side, and an opening made just above the left flank, cutting through some of the posterior ribs and turning the muscles back so as to expose the diaphragm, the spleen will be found lying between this organ and the anterior end of the stomach. It may then be readily removed with a knife and long handled fork without being handled at all. In a normal condition the spleen is of firm consistency and flesh-looking. When anthrax is present the organ is usually very much enlarged, very dark, or black in colour when cut, and of a jam-like or pulpy consistency. If the condition of the spleen supports the previous suspicion of anthrax, a drop of blood should be taken (and just a drop is sufficient), smeared between two pieces of thin glass, and forwarded to a bacteriologist for examination. The blood test is the only absolutely reliable proof of the presence of anthrax. My object is merely to bring home to the minds of members the fact that by taking some trouble to examine, learn, and note the condition of the organs of an animal in health and disease, they might frequently be able to indicate the cause of death with a fair degree of accuracy. The Stock Branch of the Department of Agriculture is always willing to assist and give advice in these matters; but it is not possible in the majority of cases for the staff officers to make a personal investigation. It becomes very important that officers should be supplied with reliable data in the shape of reasonably accurate descriptions of symptoms and morbid peculiarities of each case by the stock-owner himself. It not infrequently happens that an animal dies from some very simple cause which a careful, and sometimes even a cursory examination of the carcase would have revealed at once. But, as no such examination is attempted, the cause is never discovered, and the death of the animal ascribed by the owner, perhaps, to the eating of some poisonous weed, and by his neighbours very often set down to some infectious disease, such as anthrax or pleuro-pneumonia. On one occasion I examined the carcase of a cow that was reported to have died of pleuro-pneumonia. Indeed the appearances presented did very closely resemble those of that disease at first sight. On making a more minute search however, I found that a piece of wire about 3 inches long, which had been swallowed by the cow some considerable time before, had passed right through the wall of the second stomach, perforated the diaphragm and the sac surrounding the heart, and penetrated some

distance into the wall of the latter organ. This had set up acute inflammation of the heart sac and the membranes covering the lungs and chest wall. Hence the resemblance of the symptoms of some of those indicative of pleuro-pneumonia. Had I not made a careful examination of that carcase, I should have been seriously inclined to consider the advisability of having the place quarantined for a contagious disease. There is an old, but none the less true saying, that experience is a far better teacher than mere precept, and a few hours spent in actual work with the knife will be of greater practical benefit than as many months' study of books on the subject, however lucid they may be.

Mr. Faulkner was accorded a vote of thanks for his interesting paper.

Fruit Growing.

Mr. W. Drover read a paper on this subject:—

I have prepared a short paper on my experience on "Fruit Growing in this District." The area of my orchard at Gillenbah is about 3 acres, in which I have planted a large variety of grape vines, and the following assortment of fruit trees:—Peaches, apricots, nectarines, pears, quinces, figs, and plums (large variety). The soil is sandy loam, the garden being situated on the side of a sand hill. I consider the soil splendidly adapted for fruit-growing for dry culture or irrigation, the former in particular, because that is the only method tried by me. For dry cultivation it is necessary to keep the ground well worked and to keep it free from weeds. Digging round the trees benefits them greatly, and this should be done at least twice a year. It is advisable to plant the trees and vines a good distance apart, viz., the trees 18 feet apart in rows, and the vines 8 feet apart. The ground should be well worked prior to planting, and it will always be much easier to work afterwards. Of the stone fruits, I have found peaches, nectarines, plums, and apricots to thrive excellently. Peaches thrive particularly well, and in good seasons I have had them weigh up to 1¼ lb. each. The samples I have here are good, although not quite so large as some earlier in the season. The varieties of peaches that appeal to me as most profitable growing in this soil are Briggs' May, Elberta, Early Rivers, Early Crawford, Powell's Beauty, Royal George, Shanghai Seedling, and others. Nectarines are another fruit that grow well in these districts, and I have had some fine samples from my orchard. Plums have proved themselves very profitable. Besides being of good size, they bear heavily. All the Japanese plums, viz., Wickson, Kelsey, Burbank, and Blood, do particularly well. Apricots grow well, especially the late varieties. The same may be said of the other fruits that I have tried. Grapes are, in my opinion, one of the best assets of the garden, bearing heavily, while the berries grow to a good size. All the Muscatels do well, and find a ready sale anywhere; Black Prince, Waltham Cross, Sultanas, Centennials, Lady's Finger, Daria, and Morillion grow well, the last named in particular."

Mr. Drover produced some excellent samples of peaches, grapes, and a quince. The peaches were about 1 lb. in weight, of the Shanghai and Powell's Beauty varieties. The quince would have easily turned the scales at 1½ lb.; while the grapes were of large size, delicious flavour, and firm of flesh. The varieties of grapes exhibited were Morillion, Daria, and Waltham Cross.

Mr. Drover was heartily congratulated on the excellence of the fruit grown at his orchard.

Other subjects set down for the meeting were adjourned till next meeting.

Mr. M. Murray was asked to prepare a paper on the "Destruction of Rabbits and other Vermin."

Penrose-Kareela.

A lecture on "Insect Pests" was delivered by Mr. W. Froggatt, Government Entomologist, to members of the above branch on the 21st April.

The audience was 100 strong, and at the conclusion of the lecture numerous questions were asked and satisfactorily answered. A hearty vote of thanks was accorded Mr. Froggatt.

Quirindi.

Mr. A. H. E. McDonald, Inspector of Agriculture, was present at the initial meeting of this branch, and delivered a lecture on wheat-growing.

In the course of his lecture Mr. McDonald said that farmers, to get the best returns from the land, must study both the soil and the rainfall. The former must be studied, so that it may be worked in such a way that it will be in the best possible condition to receive the seed and support the crop. One of the farmer's most important duties is to ascertain what that condition is, and how it may be obtained. It is not merely that a good seed-bed is prepared, as such is usually understood, but that in addition the subsoil is well stored with moisture. It is quite incorrect to state that a certain piece of land is in good condition for the crop, when a fine pulverised surface overlies a dry subsoil. A farmer is only justified in crediting himself with having provided a good seed-bed, when, at sowing time, he can dig a hole in his land 2 feet or 3 feet deep and find moist earth all the way.

Such a seed-bed can only be obtained by tillage for a longer or shorter time, according to the average climatic conditions of the locality. A study of the soil will show how the work can be most efficiently and cheaply done. Some soils, as those which set readily, require much working and very careful handling, while open, loose soils may be worked quite differently. One class of implement may be used with satisfactory results on one kind of soil, while totally different implements must be used on other soils.

Certain broad principles may be taken as guides. First, the soil requires opening up to a good depth to receive the rain; secondly, the surface must be kept loose and broken to prevent loss of moisture by evaporation; third, at sowing time the under-soil should be firm, with a loose covering to receive the seed. Bearing these in mind, the farmer should work his soil according to its character. Loose, sandy soils are extremely easy to handle, as they do not set readily.

Setting of the surface is one of the greatest problems that the farmer who is working to conserve moisture has to face. It is a condition which causes most rapid exhaustion of moisture. It is due to heavy rain falling on a fine soil. The remedy, therefore, is to keep the soil open, and not too finely pulverised. This means the careful selection of the implements for cultivation. Harrows must be used with discretion, as they pulverise the soil, while disc implements have the same defect. Implements of the spring-tooth class give the best results.

The study of the rainfall of a locality is of extreme value to the farmer. He requires to study not only the rainfall of the wheat-growing period, but also of the off season, as this is of almost as much importance to him. In the North-west rather more than half the average rainfall, which ranges between 24 and 30 inches, falls during the summer months, while much of it falls in the months of January and April inclusive. As far as the conservation of moisture goes, this places the North-western farmer in a specially favoured position. He only has to fallow for a comparatively short time; and as experiments have proved, he can get splendid results by summer fallowing for the next crop after his harvest. This means that it is not necessary for him to leave his land out for a whole year to get a good fallow.

Farmers are advised to fully fallow one-third of their area every year, and to summer fallow another third. This means that half the crop would be grown on summer fallowed land and half on fully fallowed.

Let us take the case of a farmer who has just taken a crop off the land and wishes to prepare it for wheat again. Immediately the crop is gathered the land should be ploughed to about 4 inches, and left as it falls from the plough. It then lies rough and open, and rain goes right to the subsoil. In a fortnight or so a heavy fall of rain occurs which flattens the land. The spring-tooth cultivator should be started at once, and as this implement will cover about 15 acres a day a big area is soon worked. If the implement is started three or four days after the rain, it will catch weeds as they are just shooting and kill them effectually. Perhaps in another three weeks it rains heavily again. After this rain harrows may be used, as the cultivator will have left the soil ridged up slightly, and the harrows bite well. If further rain falls, the cultivator will be needed, as the land will have been flattened. By prompt attention after rain, weeds can be kept down with the cultivators and harrows. If, however, the weeds get too strong a hold, the disc-cultivator or a light plough should be used to destroy them just before sowing the wheat. On ordinary clay loams, such as are usually found in the North-west, this is the only time when the disc-cultivator should be used. It has its advantages, but it has the great disadvantage of making soil altogether too fine.

A farmer may ask, will this continual working pay? Such a farmer expects to get a crop by ploughing once, and perhaps harrowing once. We will suppose he gives three extra cultivations at 2s. per acre. This will amount to 6s. The results have shown that on the average such working increases the yield by 7 bushels. In 1911, a season specially suited for fallowing, it increased the yield at Quirindi by over 30 bushels per acre. This leaves no doubt as to its paying.

An objection which is made to fallowing is that it results in crops lodging, or being attacked by rust. In so far as the last is concerned, it may be said that crops on unfallowed ground are quite as likely, if indeed not more likely, to be attacked. Lodging can easily be prevented by sowing at the proper time and feeding-off. Far more wheat has been lost by drought than has even been lost by lodging. The danger of lodging is over-rated, because the farmer is impressed when he sees wheat lying on the ground which he cannot gather. If he had the same opportunities of seeing fallowed land alongside unfallowed, its benefits would be brought home to him.

Sowing in the North-west should not be made too early on fallowed land. May sowings give the best returns. If the sowing is made early, a strong growth will be made and this will have to be fed-off heavily, probably a couple of times. Such growth is a heavy drain on the moisture. The farmer should endeavour to use as much as possible of the moisture for the production of the grain. By maintaining a loose surface moisture is retained, and when the seed is sown in May the cold weather will prevent rapid, useless growth, as it will also check loss of moisture by evaporation. The wheat will get a strong roothold, and when spring comes a large amount of moisture will still be in the subsoil for the production of grain.

There is another point which has not received the attention it deserves The rainfall records show that October is a more reliable month for rain than September. Owing to the northern latitude of the North-west, early sown crops are in ear in September. It has happened frequently that these crops have suffered from drought whereas later crops have yielded well. On this account careful consideration should be given to the period of sowing. The remark is frequently heard that the crop can be easily checked by sheep; but as before mentioned, it is very doubtful whether continual checking with the resultant loss of moisture is to the benefit of the crop. Common-sense reasoning would indicate that it is not.

On fallowed land the drill is specially needed. This implement cuts through the loose covering, and places all the seed on the firm, moist nether soil, and thus ensures even germination. Well-fallowed land will carry a thick crop, and about 50 lb. of seed per acre should be used. As a preventive of smut, the bluestone and limewater treatment should be practised, for more seed sprouts and the plants come up quicker and are stronger. After the wheat has got a good roothold it should be harrowed. The question is asked, why is it that wheat becomes so much greener after harrowing without rain? It is owing to a greater supply of moisture becoming available for the roots. In fact, the soil becomes moist near the surface. The moisture is always rising through the soil to the surface where it evaporates. Even in apparently dry soil moisture is rising every day. When the surface is made loose with the harrows, its escape into the air is prevented, and it concentrates itself near the surface. The surface gains at the expense of the subsoil.

One farmer, more observant than most, asked, why it is that early in the morning old hoof marks of horses appear moist? It is because the compression of the soil causes the moisture to rise, and heat has not caused its evaporation as it does later in the day. This indicates the value of a loose surface. The varieties recommended for the North-west are Rymer, Federation, Marshall's No. 3, and Bunyip. The latter is extremely useful for late sowing.

Sackville.

The usual monthly meeting was held the end of April. Mr. Richard Holmes, a member of the branch, read a paper on Poultry Farming, which was discussed at length by those present. Valuable information was thus disseminated.

St. John's Park.

A branch of the Bureau has been formed at St. John's Park. The office-bearers are:—Mr. E. Buckland, Chairman; Mr. J. Warburton, Vice-Chairman; Mr. J. C. Scott, Hon. Treasurer; Mr. A. King, Hon. Secretary.

Tallawang.

At a meeting of the above branch held on the 26th April, members discussed the treatment of seed wheat.

The opinion was expressed that pickling wheat for a short period will not give the same results as when the wheat is treated for a longer period. As an example of this, Mr. Hansell pointed out that wheat had been allowed to remain in bluestone for not less than twelve hours, and that when sown this seeding gave a better result than that from wheat which had been pickled for only a few minutes.

The CHAIRMAN, Mr. T. Collins, read a paper dealing with the disease known as "Take-all." Although not very prevalent in the Tallawang district as yet, it is by no means a stranger, and members were exhorted to use all necessary care in order to prevent this dreaded disease spreading into their wheat paddocks.

DEPARTMENTAL NOTE.—Mr. H. Ross, Instructor in Agriculture, points out that it is very unwise for farmers to allow their seed wheat to lie in pickle for such a lengthy period as twelve hours. The opinion of Departmental officers, the outcome of years of experience and experiments, is that the correct treatment for pickling wheat is to steep the wheat into a 1½ per cent. solution, *i.e.*, 1½ lb. of bluestone to 10 gallons of water, from three to five minutes. In order to guard against the evil effects of the bluestone on the germination of the wheat, it is desirable that the bluestoned wheat should be dipped for two or three minutes in a solution of lime-water, which is made by using 1 lb. of freshly slaked lime to 10 gallons of water.

Taralga.

Mr. R. N. Makin, Assistant Inspector of Agriculture, visited Taralga during April, and formed a branch of the Agricultural Bureau.

After inspecting the district and taking soil samples for analysis, Mr. Makin gave a lecture in the evening on matters pertaining to agriculture. First of all, he explained how soils are formed, and the elements contained therein which go towards sustaining plant life. He dealt with the question of artificial and green manuring at some length, using numerous lantern slides to illustrate his subject. Old and new methods of cultivation were compared, costs of production of various crops were dealt with, and farmers were strongly urged, in cereal and maize growing, to use only those varieties of seed which are being recommended by the Department. Mr. Makin, in conclusion, urged farmers to apply themselves with the greatest zeal to their work, and to study out the best methods of cultivation and the best varieties to grow.

A great many questions of interest to farmers were then asked and satisfactorily answered.

The office-bearers of the Taralga Branch are:—Mr. Alfred Swan, Chairman; Mr. H. Twyman and Mr. Jas. Howard, Vice-Chairmen; Mr. John Fitzgibbon, Hon. Treasurer; Mr. D. Mullaney, Hon. Secretary.

Wyong.

A pruning demonstration will be given to members of the Wyong Branch by Mr. J. G. R. Bryant, Assistant Fruit Expert, on the 11th June.

A demonstration in clearing and subsoiling by explosives is being arranged for by Mr. H. C. Coggins, Assistant Inspector of Agriculture.

ANSWERS TO CORRESPONDENTS.

(Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.)

WHITE GRUBS EATING FRUIT OF TOMATOES.—"W.F.F.": I should be glad to see specimens of the white grub eating into the fruits of tomatoes, for it is usually the brown or greenish cut-worms that do the damage. Millipeds, slender worm-like creatures, with many fine legs on either side of the body, are sometimes called white grubs.

A poison bait, consisting of Paris green mixed with bran, in the proportion of one to sixteen, will attract most cut-worms and soon kill them off. The Paris green and bran are mixed dry and then with a little salt added the whole is made into a mash with water and scattered out in little patches under the plants.—W. W. FROGGATT.

WHITEWASH.—"J.F.": To 10 lb. of unslaked fresh burnt stone lime add 1 lb. of powdered alum, 1 lb. of powdered glue, and 3 lb. of coarse salt; slake the lime and strain through a piece of chaff bag, and having previously dissolved the other ingredients in hot water, add them to the lime. Stir well together and cover to keep the steam and heat in and allow it to remain so for two days, when it is ready for use. If necessary to thin down do so with hot water.

This may be applied to brick, stone, concrete, rough wood, or galvanized iron. Two coats are necessary for a good job and it should be applied in cool weather, or in the shade.—A. BROOKS.

SPLITTING MANDARINS.—"J.F.": It is only occasionally that varieties or certain trees act in the manner described. As treatment, give liberal dressings of stable manure with thorough cultivation, and an occasional irrigation during summer months. Where this treatment is not practicable the trees should be worked to some other variety which does not crack in that particular district. It has been found that Beauty of Glen Retreat cracks badly in some parts of our dry country, while Emperor Mandarin is fairly free from this irregularity.—W. J. ALLEN.

YOUNG FOWLS NOT LAYING.—"W.A": Although some strains of fowls commence to lay as early as 5 months, the majority, including Leghorns, do not usually commence before 7 months. In the case mentioned it is evident that the birds are getting too much to eat, resulting in internal fat. Give a packet of Epsom Salts to every dozen fowls twice a week for two or three weeks. Reduce the food and supply it only twice a day. When the birds begin to lay feed them more liberally.—G. BRADSHAW.

FRUIT-TREES AT WOLLOMBI.—"W.G.": Angelina Burdett, President, Satsuma, and Chalco plums should prove suitable for planting. The following apples can be recommended: Gravenstein, Jonathan, Pomme de Neige, Granny Smith. Packham's Triumph is a splendid pear, and should prove satisfactory. Seckel has not been grown much and Gansel's Bergamot would be better.—J. G. R. BRYANT.

INFESTATION OF BUILDING TIMBER.—"E.A.L.": This is caused by the "Powder Post Beetle" (*Lyctus brunneus*), otherwise known as the "Furniture Beetle." These beetles usually appear in the sapwood of timber and will often reduce it to a mass of dust; they are in the sapwood when the timber is used.

As soon as the tree begins to die or is cut down it is infested where these beetles are common, and in furniture they often remain in the beetle and grub state, reinfesting it for years. The beetles very often die off after going through the sapwood in large posts or joists; they do not generally spoil the whole timber.

Turpentine or kerosene poured into the infested timber is the only method of checking them.

The two specimens sent were very interesting, as the all-brown one was *Lyctusbrunneus*, the real pest, and the second, with a metallic tint and white mark on the wing-covers was a carnivorous clerid beetle, which is a parasite on the furniture beetles and their larvæ. The clerid beetle had gone into the hole in the timber to eat the real pest.—W. W. FROGGATT.

MATING EWES.—"E.S.": The age at which ewes should be joined with the ram depends upon the district, whether late or early, and the nature of the breed. On the coast the mating season is later than in districts situated further inland. Cross-breds and ewes of British origin are fit for the ram earlier than the merino. Generally merino ewes are not mated till they are over two years old, except in the case of the bigger bodied and earlier maturing type, when they are mated at about 19 months. As the mating season usually takes place in the Campbelltown district during the autumn, the weaners should be joined with the rams about next March.—J. W. MATHEWS.

SOWING FERTILISER WITH WHEAT.—"J.P.": Fertiliser for wheat invariably gives best results when drilled in with the seed, supplying about ½ cwt. per acre. Where no drill is available, the manure may be broadcasted, but in this case it will be necessary to increase the quantity to 1 cwt. per acre. This should be mixed with an equal weight of sand or ashes and should be broadcasted immediately before the seed is sown and then harrowed in with it.—GEO. VALDER.

MULBERRIES.—Mulberries require the same attention as regards cultivation as other fruit-trees. Practically very little pruning is given other than removing dead wood, or shaping the tree by cutting out crossing limbs, &c. They may be propagated from cuttings in the same way as figs. If raising the trees from cuttings, it is not necessary to bud or graft —J. G. R. BRYANT.

DRAINING BLUESTONED WHEAT.—"A.G.K.": There is no fixed time for draining a bag of dipped wheat before immersing in limewater. It should be well drained so that the value of the limewater may be retained as long as possible. A great deal depends on the size of the bag dipped. Freshly-burnt (lumpy) lime should be used at the rate of 1 lb. to 10 gallons of water.—GEO. VALDER.

WHEATS FOR HAY AND GRAIN IN THE ALBURY DISTRICT.—"W.S.N.": Hay wheats; for early sowing Zealand, for later sowing Firbank. Grain wheats; for early sowing Yandilla King and Marshall's No. 3, mid-season Federation, late Bunyip. Cattle can be grazed on rape, or on rape and mustard to advantage, but care must be taken that they do not overfeed and become blown. It is best to put them on the crop for only a short time at first and gradually increasing. It cases where wheat makes a fairly rank growth it is generally found advantageous to feed it off. Sheep are the best for the purpose.—GEO. VALDER.

TILE DRAINS IN SANDY LAND.—The drain-pipes should be placed in the ground at a depth of from 3 to 4 feet. It is advisable to place a layer of ti-tree over the pipes, and provided the latter have been carefully laid, there should be no danger of their being blocked. It is also desirable in a sandy soil to pack the pipes with a substance such as clay in order that they will not move out of position when the earth is being thrown back into the drain.—GEO. VALDER.

SEEDLING ALMONDS AND WALNUTS.—"E.A.L.": Both almonds and walnuts will produce trees and fruit from seed, but one cannot rely upon the tree raised from a seedling coming true to type. Seedlings vary in the age at which they produce, and this may be at from 8 to 20 years old. It is far preferable to raise the seedlings and then work a desirable and proved variety upon them.—J. G. R. BRYANT.

DISEASED ORANGE TREES.—"F.A.H.": The leaf submitted shows that it is affected with sooty mold (fumagine), a fungus which attacks the exudations of scale insects. Evidently the tree is infested with scale, and either fumigation or resin and soda wash should be resorted to.—J. G. R. BRYANT.

GRASS ON TENNIS COURT.—"W.M.P.": A solution of arsenite of soda, using 1 lb. of the chemical to 10 gallons of water, will be found effective in removing this.—GEO. VALDER.

BEST APPLES FOR WELLINGTON DISTRICT.—"W.T.G.": The Wellington district is not a good place for apples. The following varieties should prove suitable:—Gravenstein, Granny Smith, Cleopatra, and Statesman.—J. G. R. BRYANT.

DISEASED PEACHES.—"H.C.": The specimens received indicate that the trouble is due to punctures by the Rutherglen Bug, which has been very prevalent this year. No definite treatment has proved quite effective in controlling this pest. Small straw fires that have previously been sprinkled with sulphur and lit amongst the trees have been found to act as a temporary check to their depredations.—J. G. R. BRYANT.

PEACH TIP MOTH.—"T.W.": Spraying with arsenate of lead (commercial form) in the same way as is carried out for codlin moth will no doubt prove effective.—J.G.R. BRYANT.

COLT WITH STRINGHALT.—"S.C.B.": The cause of this disease varies greatly, and it is generally recognised as being due to obscure lesions of the spinal cord. Treatment is very unsatisfactory, as an operation which cures one case often has no effect on the next, and thus every case must be taken on its merits, and can hardly be dealt with without an actual examination.—VETERINARY OFFICERS.

Orchard Notes.

W. J. ALLEN.

JUNE.

Planting.—Where deciduous fruit-trees or vines are to be planted this season, it is best to start the work as early as possible, whether it be for refills in an established orchard, or the planting of a new orchard. The sooner now that any planting is finished the better will be the early root growth, as the roots start to throw out new growth in July. If the soil is dry, however, it would be better to defer the planting until after more rain falls; but wherever there is sufficient moisture, this work should be pushed on to completion.

Plant only such varieties as have proved themselves suitable to the district, and only plant a few varieties. Wherever there are old growers in the district, it is well to be guided by them as to which they consider the best kinds of fruits to plant; then choose the very best varieties of the respective kinds, as it is only the high-grade fruit which is worth growing.

Subsoiling.—Subsoiling is very essential before planting an orchard. My experience is that trees planted on land that has been subsoiled thrive better than on land that has not been subsoiled If the whole cannot be done at once it might be done where the trees are to be planted, say in strips 6 to 7 feet wide, and the remainder may be done from year to year, so that the whole might be finished by the third winter.

Inter-pollination.—It is claimed by some that where they have blocks of only one variety of apples planted, the crops are not nearly so good nor so regular as when several varieties are inter-planted. Bailey, in his book on the principles of fruit-growing, says, with reference to inter-pollination:—

> It is known that some varieties of fruits are self-sterile—that is, they are not fertile with themselves. This sterility may be due, as in the case of the strawberry, to imperfect (or unisexual) flowers, or, more commonly, to pollen which is impotent upon the pistils of the same flower. This infertility, or self-sterility, is largely a varietal characteristic, yet it is no doubt greatly modified by seasonal environmental conditions. It is probable that varieties may sometimes be self-fertile and at other times self-sterile.

There is very little positive knowledge concerning the inter-pollination of fruits, and no subject in pomology is in greater need of study. We chiefly know that the most productive orchards are usually those of many varieties, and that some varieties refuse to fertilize themselves. The safest practice, therefore, is to plant only a few rows, say three or four, of any one variety together, in fruits in which (like many apples and pears) sterility is often apparent.

Strawberries often lack stamens altogether, whilst others, like Crescent, have so few and such poor stamens that they are practically self-sterile. Ordinarily, there should be a row of a perfect-flowered variety for every two rows of pistillate or infertile varieties.

Pruning.—In large orchards, pruning may be pushed on with this month; otherwise there is no hurry until July. This important work should not be neglected if growers wish to get the best results. Judicious summer pruning, combined with the necessary winter pruning, will repay the grower handsomely for the labour incurred.

A complete treatise on "Pruning" may be obtained from the Government Printer, Sydney; price 1s., postage 1d.

Weak Trees.—Mark all weak and diseased trees when pruning, so that these can receive special treatment.

Liming.—Many orchards would be greatly benefited by the application of lime, and the present is a very good time to apply same, so that it will have had time to act upon the soil before the spring manuring.

Fruit Fly.—In one or two districts there are still evidences of this pest, but owing to the rigid inspection and the compulsory destruction of all fallen and infested fruits, the damage caused by this enemy is greatly reduced.

Attention should be given to fences, buildings, implements, &c., to see they are properly repaired.

I have to acknowledge, with thanks, receiving some very fine specimens of Yates' apples from Mr. Hewson, Ashbank Orchard, Penrose, and some very fine specimens of pears from Mr. H. E. Peck, Uplands, Kurrajong Heights.*

* One variety forwarded by Mr. Peck is known as La Conte. This pear is stocked by Victorian nurserymen and must not be confused with Le Conte, which is an old variety known and doing well throughout the coastal districts of this State.

Department of Agriculture,
Sydney, 2nd June, 1913.

BULLS FOR SALE

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—St. Michael of Wollongbar : sire, Trequean Mike (2103); dam, Polly 2nd of Roque Balan (imp.); calved 21st August, 1911. Price, **£40.**

Polly 2nd of Roque Balan (imp.) yielded 4,157 lb. of milk, equal to 235 lb. of butter.

Earl of Bath: sire, Monsieur Beaucaire; dam, Miss Jasmine; calved 10th December, 1911. Price, **£35.**

BULLS FOR SALE—*continued.*

AT BERRY EXPERIMENT FARM.

JERSEYS.—Ladas : sire, Berry Melbourne; dam, Lally Optician; calved 11th November, 1911; colour, whole fawn. Price, **30 guineas.**

Lally Optician is by Sir Jack from Bellona. Bellona was by Optician (imp.) from Pattibelle (192). Pattibelle (192) was by Lily's Boy (imp.) from Claribelle (imp.)

Sir Jack is by Omelette's Pride from Lady Tidy 3rd (imp.).

Omelette's Pride was by Lucy's Pride from Rum Omelette (imp.).

Lucy's Pride was by Melbourne (imp.) from Miss Lucy 3rd (imp.).

Lally Optician gave 4,177 lb. of milk on her second calf, testing 6·2 per cent., equal to 299 lb. of butter last season.

Bellona gave 4,362 lb. of milk, testing 5·9 per cent., equal to 304 lb. of butter.

Foxtail : sire, Xmas Fox (imp.); dam, Bellona; calved 24th April, 1912; colour, whole fawn. Price, **20 guineas.**

(Bellona's breeding is shown above, also milk yield.)

Pattibelle, whilst not of much account as a milk producer, was a particularly high tester. Her dam, Claribelle (imp.), was Champion Jersey female at the Royal Melbourne Show, and Pattibelle as a yearling obtained first in her class and reserve champion to her mother.

GUERNSEYS.—Belfast : sire, King of the Roses (imp.); dam, Flaxy II; calved 20th September, 1911; colour, lemon and white. Price, **40 guineas.**

Flaxy II is by Rose Prince (imp.) from Flaxy (imp.). Flaxy II's only record is 3,333 lb. of milk, testing 5 per cent. (in 1911), equal to 197 lb. of butter. Flaxy (imp.) in 37 weeks gave 6,443 lb. of milk, producing 334 lb. of butter.

Haymaker : sire, The Peacemaker; dam, Hayes Muzette 7th (imp.); calved 5th January, 1912; colour, lemon and white. Price, **40 guineas.**

The Peacemaker is by Calm Prince from Rose Petersen.

Calm Prince is by Rose Prince (imp.) from Gentle (imp.)

Rose Petersen is by Peter (imp.) from Rose Petal. Rose Petal is by Rose Prince (imp.) from Saucy Sal (imp.).

Hayes Muzette 7th (imp) in 1911 yielded 5,620 lb. of milk, testing 4·6 per cent, equal to 304 lb. of butter.

AT COWRA EXPERIMENT FARM.

JERSEY.—Shakespeare : sire, Sir Pat; dam, Leading Lady; calved 13th January, 1912; colour, whole fawn. Price, **20 guineas.**

Leading Lady is by Berry Melbourne from Lady Tidy 4th.

Lady Tidy 4th was by Golden Lord from Lady Tidy 3rd (imp.).

Berry Melbourne is by Melbourne (imp.) from Rum Omelette (imp.).

Sir Pat is by Sir Jack from Pattibelle (192).

Leading Lady, on her first calf, yielded 3,346 lb. of milk, testing 6 per cent., equal to 237 lb. of butter. Lady Tidy 4th, on her first calf, gave 3,174 lb. of milk, testing 4·5 per cent., equal to 168 lb. of butter.

HOLSTEIN COWS FOR SALE.

WOLLONGBAR EXPERIMENT FARM.

Name.	Date of Birth.	Sire.	Dam.	Price.
				£
Lolkje Field (not in calf) ...	12 Nov., 1904 ...	Garfield	Lolkje	20
Marjorie (in calf)	5 Sept., 1906 .	Chairman	Margaretha ...	30
Fraulein Arama (not in calf)..	4 Feb., 1907 ...	The Hague ...	Dina's Douwe ..	25
Marigold (not in calf) ...	25 Feb., 1907 ...	The Hague .	Margosa	25
Maggie Hague (in calf) ...	28 Aug., 1907 ...	The Hague ...	Maggie Obbe ...	30

GEORGE VALDER, Acting Under-Secretary.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull	Sire.	Dam	Stationed at—	Engaged up till—
Irish Shorthorn.	Limerick Lad (imp.)	.....	.....	Berry	*
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (im.)	Wollongbar Farm	*
,, ...	Imperialist ...	Florio	Lady Nancy of Minembah.	,, ,,	*
,, ...	March Pansy ..	Earl March	Australian Pansy	Grafton Farm ...	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
,, ...	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	,, ,,	*
,, ...	Elaine's Heir ...	Thessalian II ...	Wagga Elaine	Yanco Farm ...	*
,, ...	Royal Blood ...	Berry Melbourne	Calceolus ...	,, ,,	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie ...	Berry Farm ...	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Wagga Farm ...	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Kyogle	22 Dec., 13.
,, ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	,, ...	5 Mar., '14.
,, ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Grafton Farm ...	†
,, ...	Prince Souvia ...	Vivid's Prince...	Souvenir(imp.)	Grafton ,, ...	†
,, ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Casino	22 June, '13.
,, ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '13.
,, ...	Sunshine ...	King of the Roses	Princess Vivid	Grafton Farm ...	*
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	Claudius (imp.)	Golden Star II..	Claudia's Pride(imp.).	Tweed River ...	18 Aug., '13
,, ...	Trengwainton VillageFavourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
,, ...	Good-bye ...	Western Duke...	Souvenir (imp.)	Wollongbar Farm	†
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Tinonee	1 June, '14.
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (im.)	Bega	1 Dec., '13.
,, ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Wollongbar Farm	†
,, ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel(imp.).	Murwillumbah ...	10 Nov., '13.
,, ...	Prince of Warren Wood (imp.).	Kingsmoor Governor (1952)	Quail (7051)	Macleay River ...	1 Dec., '13.
,, ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Frederickton ...	14 Dec., '13.
,, ...	Rosehill (imp.)..	Northesk (2073)	Faultless Footsteps (6132)	Raymond Terrace	19 June, '13.
,, ...	Duke of Orleans	Godolphin Arthur (1664)	Flower of the Preel 3rd (imp.)	H.A. College, Richmond	*
Ayrshire ...	Jamie's Heir ...	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ...	*
,, ...	Orphan Boy ...	Songster of Greystanes.	Rosamond ...	Glen Innes Farm..	*
,, ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A.College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin(imp.)	Bratha 4th ...	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

* Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.

STALLION PARADES FOR JUNE AND JULY, 1913.

Date.		Place.	Time.
Tuesday,	3 June	Culcairn	10 a.m.
Wednesday,	4 ,,	Corowa	10 a.m.
Friday,	6 ,,	Germanton	10 a.m.
Tuesday,	10 ,,	Grenfell	2 p.m.
Thursday,	12 ,,	Young	10 a.m.
Friday,	13 ,,	Murrumburrah	10 a.m.
Wednesday,	18 ,,	Cumnock	11 a.m.
Thursday,	19 ,,	Molong	10 a.m.
,,	19 ,,	Murwillumbah	11·30 a.m.
,,	19 ,,	Finlay	10 a.m.
Friday,	20 ,,	Mullumbimby	10 a.m.
,,	20 ,,	Manildra	10 a. m.
Saturday,	21 ,,	Bangalow	10 a.m.
Monday,	23 ,,	Lismore	10 a.m.
Tuesday,	24 ,,	Alstonville	10 a.m.
,,	24 ,,	Forbes	11 a.m.
Wednesday,	25 ,,	Parkes	11 a.m.
,,	25 ,,	Casino	2 p.m.
Thursday,	26 ,,	Coraki	11 a.m.
,,	26 ,,	Cudal	11 a.m.
Friday,	27 ,,	Kyogle	Noon.
Wednesday,	2 July	Grafton	10 a.m.
Thursday,	3 ,,	Maclean	11 a.m.
Saturday,	5 ,,	Coramba	10 a.m.
Monday,	7 ,,	Bellinger	10 a.m.
Wednesday,	9 ,,	Dorrigo	10 a.m.
,,	9 ,,	Condobolin	2·30 p.m.
Thursday,	10 ,,	Bogan Gate	3·30 p.m.
Friday,	11 ,,	Bowraville	10 a.m.
,,	11 ,,	Trundle	10 a.m.
Saturday,	12 ,,	Macksville	10 a.m.
Monday,	14 ,,	Kempsey	10 a.m.
,,	14 ,,	Peak Hill	2 p.m.
Wednesday,	16 ,,	Narromine	10 a.m.
,,	16 ,,	Port Macquarie	10 a.m.
Thursday,	17 ,,	Trangie	11 a.m.
Friday,	18 ,,	Wellington	11 a.m.
Saturday,	19 ,,	Taree	Noon.
Monday,	21 ,,	Wiugham	10 a.m.
Wednesday,	23 ,,	Nabiac	10 a.m.
Thursday,	24 ,,	Gloucester	10 a.m.
,,	24 ,,	Cootamundra	10 a.m.
Friday,	25 ,,	Junee	10 a.m.
,,	25 ,,	Dungog	Noon.
Monday,	28 ,,	Richmond	11 a.m.
Tuesday,	29 ,,	Wagga Wagga	10 a.m.
Wednesday,	30 ,,	Dural	11 a.m.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1913.

Society.	Secretary.	Date.
N.S W. Sheepbreeders' Association (Sydney)	H. N. Bowden	July 2, 3, 4, 5
Wentworth P., A., and I. Society	W. B. Crang	,, 17
Deniliquin P. and A. Society	L. Harrison	,, 17, 18
Peak Hill P., A., and H. Association	A. Yeo	,, 30, 31
Narrandera P. and A. Association	W. T. Lynch	Aug. 5, 6
Murrumbidgee P. and A. Association (Wagga)	A. F. D. White	,, 19, 20, 21
Corowa P., A., and H. Society	John D. Fraser	,, 26, 27
Gunnedah P., A., and H. Association	M. C. Tweedie	,, 26, 27, 28
Barmedman A. and H. Society	P. H. Sheehan	,, 27
Parkes P., A., and H. Association	G. W. Seaborn	,, 27, 28
Ariah Park P., A., H., and I. Association	J. N. Taylor	Sept. 2, 3
Wellington P., A., and H. Society	A. E. Rotton	,, 2, 3
Manildra P. and A. Association	C. M. Podmore	,, 3
Germanton P., A., and H. Society	J. S. Stewart	,, 3, 4
Junee A. Association	T. C. Humphreys	,, 3, 4
Young P. and A. Association	T. H. Tester	,, 9, 10, 11
Albury and Border P., A., and H. Society	W. I. Johnson	,, 9, 10, 11
Cootamundra A., P., H., and I. Association	T. Williams	,, 16, 17
Cowra P., A., and H. Association	G. S. Fisher	,, 16, 17
Ganmain A. and P. Association	J. F. Ashwood	,, 16, 17
Murrumburrah P., A., and I. Association	J. A. Foley	,, 23, 24
Riverina P. and A. Society (Jerilderie)	J. Kennedy	,, 24
Hay P. and A. Association	G. S. Camden	,, 30, Oct. 1
Yass P. and A. Association	W. Thomson	Oct. 1, 2
Hillston P. and A. Association	S. J. Gordon	,, 8
Tweed River Agricultural Society (Murwillumbah)	A. E. Budd	Nov. 12, 13

1914.

Albion Park A., H., and I. Association	M. A. Brown	Jan. 14, 15
Kiama A. Association	G. A. Somerville	,, 23, 24, 26
Guyra P., A., and H. Society	P. N. Stevenson	Feb. 17, 18, 19
Inverell P. and A. Association	J. McIlveen	,, 25, 26, 27
Uralla A. Association	H. W. Vincent	Mar. 3, 4, 5
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 3, 4, 5
Central New England P. & A. Association (Glen Innes)	George A. Priest	,, 10, 11, 12
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 11, 12, 13
Armidale and New England P., A., and H. Assoc'n.	A. McArthur	,, 17, 18, 19, 20
Camden A., H., and I. Society	C. A. Thompson	,, 18, 19, 20
Goulburn A., P., and H. Society	G. G. Harris	,, 19, 20, 21
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins	April 1, 2, 3
Royal Agricultural Society (Sydney)	H. M. Somer	,, 7–15
Bathurst A., H., and P. Association	J. Bain	,, 22, 23, 24
Northern Agricultural Association (Singleton)	E. J. Dann	,, 29, 30, May 1.

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Agricultural Gazette of New South Wales.

Field Experiments with Wheat, 1912.

IN authorising the publication of this report, the Experiments Supervision Committee, under whose direction the experiments are conducted, desire to draw attention to the fact that the results are for one year only, and therefore no conclusions can be drawn. It is felt, however, that the public are entitled to know the results as they are obtained.

XIII.—MULCHING EXPERIMENTS.

Object.—To determine the most efficient mulch for conserving moisture in fallowed land, as indicated by the yield of the succeeding wheat crop. The experiment is divided into three sections: Section 1, to ascertain the most efficient depth to work the surface of the fallowed land; Section 2, to determine the most efficient implement to use; Section 3, to ascertain the best time of the year to work the fallow.

A rotation is adopted in this experiment which will maintain the fertility of the soil and which can be recommended to the farmers of the district for adoption on a large scale. A rotation is arranged for each farm conducting the experiment according to the requirements of the district.

In Section 1 the produce from, and the moisture contents of soil protected by mulches of 2, 3, 4, and 6 inches are compared with each other, and with the produce and moisture content of unmulched ploughed land. After ploughing, the soil (except that on the unmulched plot and the one mulched 6 inches deep), is broken down by harrowing, and the surfaces mulched to the depth required. During the summer and until within four to six weeks of planting, the ground is worked to maintain an efficient covering of dry earth and to the depth required by the experiment. After a date from four to six weeks prior to planting, the working of the soil is the same for all plots, and is from 2 to 3 inches deep.

Section 2 is subdivided into two subsections, (*a*) and (*b*), the spring ploughing in one subsection being done with the mould-board plough, and in the other with the disc. The depth of ploughing in each case

is 6 inches, and the other treatment of the soil is also similar. The returns from plots mulched with the skim plough, disc cultivator and spring-tooth cultivator are compared with each other.

Section 3 is also divided into two subsections, (*a*) and (*b*), in which mulches formed by the skim-plough and the disc cultivator are compared. The mulches in this section are uniformly 3 inches deep, the spring ploughing is done with the same implement throughout, and is to a uniform depth of 6 inches.

WAGGA EXPERIMENT FARM.

R. W. McDIARMID, Experimentalist.

In conducting these experiments the following rotation is being observed—wheat, fodder crop, fallow. This requires three blocks of land which are being cropped as follows:

	Block (a).	Block (b).	Block (c).
1910	fallow	fodder	wheat
1911	wheat	fallow	fodder
1912	fodder	wheat	fallow
1913	fallow	fodder	wheat

Throughout the series of experiments dealing with the fallows, only two plots conserved sufficient moisture to germinate the grain prior to the rainfall on June 10th. These were plots that had been harrowed immediately after ploughing and well worked during the summer months.

The plots of these experiments were double ones, with a neutral area between each. They were double to allow of a space down the centre for any ridges or "clean-outs" that may be essential in cultivating, and the neutral areas were inserted for the overlapping of the various implements used on the adjacent plots. This method ensured the crop considered being on the one (only) way of working the ground. The neutral areas were sown the same as the other portions of the plots to avoid waste of ground.

In harvesting, the centre of each plot only was considered, and prior to this a piece was taken from each end to reduce the plots to an even fraction of an acre, and to remove any irregularities in drilling at the ends of the plots.

The rainfall for 1912 was the lowest recorded for many years, and, as will be seen from the table below, most of it fell during the latter half of the year, the first five months recording only 101 points. Such a dry season was responsible for late crops, and crops containing an unusual amount of wild oats and weeds, particularly so on the fallow.

The distribution for 1912 was as follows:—

			Points.	Points.
January	6	... ...	15	
				15
February	8	... ...	30	
	17	... ...	20	
	25	... ...	5	
				55
March	29	... ...	4	
				4
April	7	... ...	8	
	16	... ...	9	
	22	... ...	8	
				25
May	31	... ...	2	
				2
June	10	... ...	83	
	11	... ...	20	
	15	... ...	25	
	25	... ...	30	
	26	... ...	13	
				171
July	1	... ...	8	
	2	... ...	36	
	4	... ...	30	
	8	... ...	33	
	9	... ...	35	
	12	... ...	9	
	24	... ...	96	
	25	... ...	14	
	26	... ...	20	
	27	... ...	28	
				309
August	2	... ...	20	
	5	... ...	66	

			Points.	Points.
August	6	... ...	2	
	7	... ...	17	
	8	... ...	2	
	12	... ...	7	
	23	... ...	13	
	26	... ...	50	
	27	... ...	27	
	28	... ...	2	
	29	... ...	10	
				216
September	3	... ...	73	
	6	... ...	15	
	7	... ...	31	
	14	... ...	22	
	18	... ...	17	
				158
October	4	... ...	51	
	5	... ...	9	
	28	... ...	61	
				121
November	4	... ...	87	
	8	... ...	12	
	19	... ...	64	
				163
December	2	... ...	40	
	4	... ...	38	
	6	... ...	11	
	9	... ...	22	
	10	... ...	23	
	23	... ...	15	
	26	... ...	21	
				170
Total		... ...	1,409	points.

Section 1.

The following mulches were used:—2 inches, 3 inches, 4 inches, 6 inches, as well as a no mulch. The 3-inch mulch was used as the check plot, and inserted alongside every other mulch.

PLAN SHOWING ARRANGEMENT OF THE PLOTS.

	Buffer Plot.
1. (*Check*)	mulched 3 inches deep.
2.	,, 2 inches ,,
3.	,, 4 inches ,,
4. (*Check*)	,, 3 inches ,,
5.	,, 6 inches ,,
6.	not mulched.
7. (*Check*)	mulched 3 inches ,,
	Buffer Plot.

The land was ploughed with the double-furrow mould-board plough to a depth of 5 inches during the second week of August. The ploughing was across the direction of the plots.

All the plots except Nos. 5 and 6 were harrowed down after ploughing, and the first cultivation with the skim plough was given to all the plots except No. 6, to the required depth on 25th October. The second cultivation was given on 13th January. This was the final with the skim plough. Just prior to sowing the seed all of the plots were worked with the disc cultivator to even up the land for sowing. This disking was done across all of the plots to a depth of 3 inches.

On 27th May all plots were sown with Comeback wheat at the rate of 44 lb. seed per acre and with 56 lb. superphosphate per acre. The seed was previously treated with a 2 per cent. solution of bluestone by immersing it for three minutes.

TABLE showing the results in Section 1.

Area of each plot: One-third acre.
Variety: Comeback at 44 lb. per acre.
Fertiliser: Superphosphate at 56 lb. per acre.
Date sown: 27th May, 1912.

Plot No.	Method of Mulching.	Yield per plot.	Yield per acre.	Natural yield.	Percentage.
		lb.	bushels.	bushels.	
1. (*Check*) ...	Mulched 3 inches deep ...	402	20 1	20·1	100
2.	,, 2 ,, ,, ...	386	19·3	20·77	92·9
5.	,, 4 ,, ,, ...	406	20·3	21·43	94·7
4. (*Check*) ...	,, 3 ,, ,, ...	442	22·1	22·1	100
5.	,, 6 ,, ,, ...	428	21·4	22·22	96·3
6.	Not mulched	344	17·2	22.33	77·0
7. (*Check*) ...	Mulched 3 inches deep ...	449	22·45	22·45	100

(Average yield of check plots—21·55 bushels per acre.)

The advantage of well working the ground is evident from the above yields. The differences between the plots were not noticeable until the hot, dry weather commenced, when it readily showed where the moisture had been conserved. Had the plots been harvested for hay the one mulched 6 inches deep would probably have topped the list. The plot worked to a depth of 2 inches, and the one "not mulched" dried off rapidly.

Section 2.

One section was ploughed with the mould-board plough to a depth of 5 inches on 16th August, 1911. The other section was disc ploughed to a similar depth on 17th to 20th August. Both were left unharrowed.

The plots were mulched with the respective implements and to the required depth on the following dates:—

Skim-plough plots: 26th October, 1911, 12th January, 1912.
Disc cultivator plots: 24th October, 1911, 10th January, 1912.
Spring-tooth plots: 26th October, 1911, 15th January, 1912.

About the middle of April the disc cultivator was crossed over all the plots to even up the land ready for sowing.

The plots were sown on the 28th May, 1912, with Comeback wheat at the rate of 44 lb. per acre, and fertilised with superphosphate at the rate of 56 lb. per acre. The seed was treated with a 2 per cent. bluestone solution, immersed for 3 minutes.

TABLE showing results in Section 2.

Area of each plot: One-third acre.
Variety: Comeback at 44 lb. per acre.
Fertiliser: Superphosphate at 56 lb. per acre.
Date sown: 28th May, 1912.

PLOUGHED WITH MOULD-BOARD PLOUGH.

Plot No.	Cultivator used.	Yield 1 plot.	Yield per acre.	Natural yield.	Percentage.
		lb.	bushels.	bushels.	
1. (*Check*) ...	Skim plough	436	21·8	21·8	100
2.	Disc	445	22·25	21·45	103·7
3.	Spring tooth	370	18·5	21·1	87·7
4. (*Check*) ...	Skim plough	415	20·75	20·75	100

(Average yield of check plots—21·28 bushels per acre.)

PLOUGHED WITH DISC PLOUGH.

Plot No.	Cultivator Used.	Yield per Plot.	Yield per Acre.	Natural Yield.	Percentage Yield.
		lb.	bushels.	bushels.	
1. (*Check*) ...	Skim plough	414	20·7	20·7	100
2.	Disc	400	20	20·65	96·8
3.	Spring-tooth	339	16·95	20·6	82·3
4. (*Check*) ...	Skim plough	411	20·55	20·55	100

(Average yield of check plots = 20·625 bushels per acre.)

The above indicates that there is only a slight difference between the two types of ploughs used, and practically no difference between the skim plough and the disc cultivator. They are both superior to the spring-tooth cultivator.

During the growth of the crops the difference was not perceptible until late in the season, when the spring-tooth plots began to dry off. The other cultivators showed no difference, neither was there any noticeable difference between the two ploughs used.

Section 3.

The ploughing for this experiment was done with the disc plough to a depth of 5 inches, from the 17th to the 21st August.

The plots worked immediately after ploughing were harrowed down, but all others left unharrowed.

The various times of working the plots are shown in the accompanying plan.

PLAN showing the arrangement of the Plots.

Buffer Plot.	
1 (*Check*).	January.
2.	Immediately after ploughing.
3.	Just prior to ploughing.
4 (*Check*).	January.
5.	November.
6.	December.
7 (*Check*).	January.
Buffer Plot.	

In sub-section (*a*) the mulching implement was the skim plough, and in sub-section (*b*) the mulching implement was the disc cultivator—both sub-sections being treated as to time according to the above plan.

The January plots were cultivated on the 11th January, 1912. The second plots were cultivated on the 26th October, 1911, and 28th December, 1911. The third plots were cultivated only just prior to sowing. The November plots were cultivated on the 12th December, 1911, weather conditions making November working impossible. The December plots were cultivated on the 28th December, 1911.

All the plots of each sub-section were disc-cultivated across on the 15th and 16th April, to even them up for sowing.

From the tables of one year's results may be seen the effect of early cultivation upon the resulting crop. The difference between the well-worked and unworked land was nearly 3 bushels per acre in the case of the skim plough, and over 4 bushels per acre where the disc cultivator was used.

The actual results do not reveal as much difference between the skim plough and the disc cultivator as was anticipated while the crop was growing. Had the plots been harvested for hay there is no doubt there would have been a larger difference in favour of the disc cultivator.

TABLE showing the results in Section 3.

Area of plots : One-third acre.
Variety : Comeback at 44 lb. per acre, treated with 2 per cent. bluestone solution.
Fertiliser : Superphosphate at 56 lb. per acre.
Date sown : 27th May, 1912.

MULCHED WITH SKIM PLOUGH.

Plot No.	Cultivation Commenced.	Yield per Plot.	Yield per Acre.	Natural Yield.	Percentage.
		lb.	bushels.	bushels.	
1. (*Check*) ...	January	367	18·35	18·35	100
2.	Immediately after ploughing	383	19·15	17·67	108·3
3.	Just prior to sowing	337	16·85	1	99·2
4. (*Check*) ...	January	326	16·3	16·3	100
5.	November*	361	18·05	16·88	106·9
6.	December	379	18·95	17·47	108·5
7. (*Check*) ...	January	361	18·05	·05	100

(Average yield of check plots = 17·56 bushels per acre).

MULCHED WITH DISC CULTIVATOR.

Plot No.	Cultivation Commenced.	Yield per Plot.	Yield per Acre.	Natural Yield.	Percentage.
		lb.	bushels.	bushels.	
1. (*Check*) ...	January	330	16·5	16·5	100
2.	Immediately after ploughing	400	20	17·1	117
3.	Just prior to sowing	317	15·85	17·7	89·5
4. (*Check*) ...	January	366	18·3	18·3	100
5.	November*	394	19·7	18·32	107·5
6.	December	362	18·1	18·34	98·7
7. (*Check*) ..	January	367	18·35	18·35	100

(Average yield of check plots = 17·72 bushels per acre).

*November plots could not be cultivated until the 12th December, owing to the weather.

BATHURST EXPERIMENT FARM.

J. W. SHAW, Experimentalist.

Rotation and Blocks required.

As the rotation adopted at this farm is a two-course one, two blocks are required for the experiment. One is planted with wheat and the other with fodder crops every alternate year. The fodder crop consists of Rape and Barley sown in the month of February in alternate drills. Superphosphate at the rate of 56lb. to the acre is applied with this crop. It is fed off with sheep during the winter months and in October the main ploughing is commenced in all sections.

Arrangement of Plots.

Instead of having single plots, as is usually the case, it was thought advisable to make the area under each treatment wide enough to plant two plots. A space of 5 links is allowed between them for convenience in harvesting. As at Wagga a neutral area was provided. The plots in sections 1 and 2 are all two widths of the drill wide. Unfortunately the area available for section 3 was not sufficient to allow of two widths. The plots in this section are only one drill in width.

Ploughing was commenced in the middle of October in all three sections. The main ploughing was done at right angles to the plots to the depth of 6 inches. In this case it is not necessary to bother about the furrows as all the plots will cross them and so be comparable.

The subsequent working of the land under the different treatments was done across the main ploughing. Each time the land was worked in the various ways it was always arranged that ridges and furrows were in the neutral areas provided for the purpose.

Section 1.

This section contained seven plots. The land was ploughed with a mould-board plough and afterwards all the plots harrowed with the exception of No. 6, which was left in the rough.

Three of the plots acted as checks and were worked to a depth of 3 inches. Three others were worked 2, 4, and 6 inches respectively. The remaining plot was left in the rough state until just prior to planting when all the plots were worked to a uniform depth of 3 inches. The implement used is a light skim plough.

After every shower of rain of any magnitude or when weed growth made it desirable, the plots with the exception of No. 6 (unmulched) were worked to their respective depths.

TABLE showing results in Section 1.

Plough :—Mould-board.
Mulching Implement :—Skim Plough.
Date sown : 11th April, 1912.
Area of Plots : One-tenth acre.

Plot No.	Depth of Mulch.	No. 1 Plot.		No. 2 Plot.		Average Yield.	Natural Yield.	Per-centage.
		Per Plot.	Per Acre.	Per Plot.	Per Acre.			
		lb.	bush.	lb.	bush.	bush.	bush.	
1. (*Check*) ...	3 inches	49	8·16	50	8·33	8·24	8·24	100
2.	2 ,, ...	49	8·16	58	9·66	8·91	8·21	108·52
3.	4 ,, ...	61	10·16	62	10·33	10·24	8·18	125·18
4. (*Check*) ...	3 ,, ...	62	10·33	36	6·00	8·16	8·16	100
5.	6 ,, ...	64	10·66	76	12·66	11·66	9·55	122·09
6.	Not mulched ...	80	13·33	56	9·33	11·33	10·94	103·56
7. (*Check*) ..	3 inches	82	13·66	66	11·00	12·33	12·33	100

Section 2.

This section is divided into two portions of equal area. One portion was ploughed with the disc and the other with the mould-board to a depth of 6 inches. Each contains four plots of equal area. Two in each acted as checks and were worked with a skim plough to a depth of 3 inches. The other two were worked with a disc plough and spring-tooth cultivator to the same depth.

After every shower of rain of any magnitude, or when weed growth made it desirable, the plots on both portions were worked with the different implements.

Table showing the results in Section 2.

Date sown : 11th April, 1912.
Area of Plots : One-tenth acre.

BLOCK A.—MOULD-BOARD PLOUGH.

Plot No.	Mulching Implement.	No. 1.		No. 2.		Average Yield.	Natural Yield.	Per-centage.
		Per Plot.	Per Acre.	Per Plot.	Per Acre.			
		lb.	bush.	lb.	bush.	bush.	bush.	
1. (*Check*) ...	Skim Plough ...	37	6·16	73	12·16	9·16	9·16	100
2.	Disc Cultivator ...	78	13·00	63	10·5	11·75	10·30	114·07
3.	Spring Tooth ...	70	11·66	72	12·0	11·83	11·44	103·40
4. (*Check*) ...	Skim Plough ...	68	11·33	83	13·83	12·58	12·58	100

BLOCK B.—DISC PLOUGH.

1. (*Check*) ...	Skim Plough ...	58	9·66	78	13·00	11·33	11·33	100
2.	Disc Cultivator ...	64	10·66	80	13·33	12·00	13·55	88·56
3.	Spring Tooth ...	101	16·83	73	12·16	14·50	15·78	91·88
4. (*Check*) ...	Skim Plough ...	118	19·66	98	16·33	18·00	18·00	100

Section 3.

This section, like No. 2, is divided into two portions of equal area. Both were ploughed with the mould-board 6 inches deep, but the subsequent working of the fallow on one half was done with the disc cultivator, and on the other half with the skim plough.

Each portion contained seven plots, three of which were checks, and were worked to a depth of 3 inches in the month of January.

One plot in each portion was worked immediately after the main Spring ploughing in October. Two other plots, one in each portion, were worked in November, and two others in the same way in December.

The plot remaining in each was left until just prior to planting, when it was worked with the others to a depth of 3 inches.

As soon as the first mulching of any of the plots had been done, they were worked after every shower of rain of any magnitude, or when weed growth made it desirable.

TABLE showing the results in Section 3 :—

BLOCK A.

Plough : Mould-board.
Mulching Implement : Skim Plough.
Date planted : 4th April, 1912.
Area of Plots: one-thirtieth acre.

Plot No.	Time of Mulching.	No. 1.		No. 2.		Average Yield.	Natural Yield.	Per-centage.
		Per Plot.	Per Acre.	Per Plot.	Per Acre.			
		lb.	bush.	lb.	bush.	bush.	bush.	
1. (*Check*) ...	January	40	20·0	44	22·0	21·0	21·0	100
2.	Immediately after ploughing ...	40	20·0	39	19·5	19·75	17·92	110·21
3.	Just prior to planting	26	13·0	17	8·5	10·75	14·84	72·45
4. (*Check*) ...	January	26	13·0	21	10·5	11·75	11·75	100
5.	November	26	13·0	27	13·5	13·25	13·0	101·92
6.	December	33	16·5	31	15·5	16 0	14·25	112·28
7. (*Check*) ...	January	29	14·5	33	16·5	15·5	15·5	100

BLOCK B.

Plough : Mouldboard.
Mulching Implement : Disc Cultivator.

Plot No.	Time of Mulching.	No. 1.		No. 2.		Average Yield.	Natural Yield.	Per-centage.
		Per Plot.	Per Acre.	Per Plot.	Per Acre.			
		lb.	bush.	lb.	bush.	bush.	bush.	
1. (*Check*) ...	January	31	15·5	29	14·5	15·0	15·0	100
2.	Immediately after ploughing ...	20	10·0	39	19·5	14·75	14·33	102 93
3.	Just prior to planting	30	15·0	28	14·0	14·5	13·66	106·15
4. (*Check*) ...	January	28	14·0	24	12·0	13·0	13·00	100
5.	November	31	15·5	31	15·5	15·5	11·91	130·14
6.	December	26	13·0	24	12·0	12·5	10·83	115·43
7. (*Check*) ...	January	22	11·0	17	8·5	9·75	9·75	100

Soil Variations.

Unfortunately the soils in the paddock in which these experiments are located are not very uniform.

It is almost impossible to choose an area of land to carry out experiments of this kind, without some great difference in the soil. Where implements are being tested this is most important.

At this farm the area devoted to the disc in Section No. 2 had a great advantage over the portion worked with the mould-board plough. The soil on this portion is volcanic and of a dark reddish colour. The crop grown upon it was far superior to anywhere else, and for this reason the higher results obtained from the disc cannot be altogether attributed to the implement.

The peculiarity of this soil is that it is self-mulching, and does not run together to anything like the same extent as other types of soils. Other portions of the paddocks are somewhat similar, but the majority is of such a nature that with excessive rains it sets down hard almost like cement.

Previous Treatment.

In March, 1911, the two paddocks devoted to the mulching experiments were sown with Cape Barley and Rape in alternate drills. Superphosphate at the rate of ½ cwt. per acre was applied with the seed.

The crop was eaten off during the winter months, and in October the first ploughing of the experiments was performed to a depth of 6 inches.

All the plots in Section No. 1 with the exception of No. 6 (unmulched) were harrowed immediately after the ploughing was completed.

NYNGAN DEMONSTRATION FARM.

H. J. KELLY, Manager.

Owing to the drying winds which prevailed, and the total absence of rain during the month of September, it was decided to harvest the whole of the experiments for hay, leaving none for grain, as previously intended. The plots were reduced to one-fifth acre each, and harvested on the 8th and 9th October. The hay was weighed and carted in on the 4th and 5th November, having stood in the stooks drying for almost four weeks. It was quite fit for stacking, no mustiness being evident in the stacks when they were recently opened up.

Detailed results are given in the attached tables, which also show the moisture content in each plot to a depth of 30 inches at the time of planting.

As no moisture was visible to a depth of 8 inches from the surface when samples were taken, only samples of soil from 6 inches deep to 30 inches deep were taken, as follows :—

1st sample in each plot, 6 inches to 12 inches deep.
2nd „ „ „ „ 12 „ „ 21 „ „
3rd „ „ „ „ 21 „ „ 30 „ „

The soil samples were sent in air-tight tin canisters to the laboratory, and the moisture contents determined by the Chemist's Branch.

In Section 3 it will be noticed that the plots mulched "immediately after ploughing," and during November and December, yielded considerably higher than plots not mulched until January, and just prior to planting.

This would be expected, as during November and up to the 18th December heavy rains fell, and the mulching immediately after the rain of the latter date would conserve to a great extent the moisture thus received. This is borne out by the analysis of the soil samples as given, while the extremely drying conditions which followed would cause great loss of moisture by evaporation from the unmulched surfaces.

The experiment shows that the loss of moisture must have occurred prior to the 17th January, on which date the mulching of the January-mulched plots was done. Although these experiments have only been carried on for one year, which trial is insufficient to permit of any definite deductions, they indicate very forcibly the necessity for the commencement of mulching early in the season, and for the cultivation of fallowed land as soon as possible after each rainfall which is sufficient to destroy the loose mulch previously existing.

The depth of mulching and the type of implement to use for that purpose would at present appear to be of secondary consideration, as a 2-inch mulch gave almost equal results with the 3-inch and 4-inch mulches, and slightly better than a 6-inch mulch, while the different implements used in the operations gave only slightly varying results.

TABLE showing Results in Section 1.

PLOUGHED 6 INCHES DEEP WITH MOULD-BOARD PLOUGH.

Mulched with Skim Plough. Crop cut as Hay and estimated in lb.

Plot No.	Depth of Mulching.	Moisture Determined by Analysis.	Yield.
1. (*Check*)...	3 inches deep...	Not taken	Plot ... 735 lb. Per acre ... 3,675 ,, Natural ... 3,675 ,, Percentage, 100
2.	2 inches deep...	6 inches to 12 inches = 8·31 % 12 ,, 21 ,, = 11·42 ,, 21 ,, 30 ,, = 11·74 ,,	Plot ... 746 lb. Per acre ... 3,730 ,, Natural ... 3,716 ,, Percentage, 100·3
3.	4 inches deep...	6 inches to 12 inches = 7·61 % 12 ,, 21 ,, = 11·72 ,, 21 ,, 30 ,, = 14·05 ,,	Plot ... 753 lb. Per acre ... 3,765 ,, Natural ... 3,758 ,, Percentage, 100·2
4. (*Check*)...	3 inches deep...	Not taken	Plot ... 760 lb. Per acre ... 3,800 ,, Natural ... 3,800 ,, Percentage, 100
5.	6 inches deep...	6 inches to 12 inches = 8·35 % 12 ,, 21 ,, = 11·38 ,, 21 ,, 30 ,, = 13·3 ,,	Plot ... 722 lb. Per acre ... 3,610 ,, Natural ... 3,823 ,, Percentage, 94·1
6.	Not mulched...	6 inches to 12 inches = 6·38 % 12 ,, 21 ,, = 9·29 ,, 21 ,, 30 ,, = 10·74 ,,	Plot ... 343 lb. Per acre ... 2,170 ,, Natural ... 3,846 ,, Percentage, 56·4
7. (*Check*)...	3 inches deep...	6 inches to 12 inches = 7·44 % 12 ,, 21 ,, = 10·96 ,, 21 ,, 30 ,, = 12·25 ,,	Plot ... 774 lb. Per acre ... 3,870 ,, Natural ... 3,870 ,, Percentage, 100

TABLE showing results in Section 2.

PLOUGHED WITH MOULD-BOARD PLOUGH.

Plot Number.	Mulching Implement.	Moisture determined by Analysis.	Yield.
1. (*Check*)...	Skim plough	Not taken	Plot ... 696 lb. Per acre ... 3,480 ,, Natural ... 3,480 ,, Percentage, 100
2.	Disc cultivator.	6 inches to 12 inches = 8·86 % 12 ,, 21 ,, = 11·43 ,, 21 ,, 30 ,, = 12·32 ,,	Plot ... 707 lb. Per acre ... 3,535 ,, Natural ... 3,453 ,, Percentage, 102·3
3.	Spring-tooth cultivator.	6 inches to 12 inches = 7·50 % 12 ,, 21 ,, = 12·0 ,, 21 ,, 30 ,, = 13·21 ,,	Plot ... 647 lb. Per acre ... 3,235 ,, Natural ... 3,426 ,, Percentage, 94·4
4. (*Check*)...	Skim plough	6 inches to 12 inches = 8·0 % 12 ,, 21 ,, = 12·1 ,, 21 ,, 30 ,, = 13·0 ,,	Plot ... 680 lb. Per acre... 3,400 ,, Natural ... 3,400 ,, Percentage, 100

PLOUGHED WITH DISC PLOUGH.

1. (*Check*)...	Skim plough ...	Not taken	Plot ... 727 lb. Per acre... 3,635 ,, Natural ... 3,635 ,, Percentage, 100
2.	Disc cultivator.	6 inches to 12 inches = 9·43 % 12 ,, 21 ,, = 12·11 ,, 21 ,, 30 ,, = 12·75 ,,	Plot ... 743 lb. Per acre... 3,715 ,, Natural ... 3,565 ,, Percentage, 104·2
3.	Spring-tooth cultivator.	6 inches to 12 inches = 8·95 % 12 ,, 21 ,, = 11·79 ,, 21 ,, 30 ,, = 12·33 ,,	Plot ... 636 lb. Per acre... 3,180 ,, Natural ... 3,495 ,, Percentage, 93·8
4. (*Check*)...	Skim plough	6 inches to 12 inches = 9·3 % 12 ,, 21 ,, = 12·87 ,, 21 ,, 30 ,, = 13·31 ,,	Plot ... 685 lb. Per acre... 3,425 ,, Natural ... 3,425 ,, Percentage, 100

TABLE showing results in Section 3.

PLOUGHED WITH DISC PLOUGH.

Mulched with Skim Plough.

Plot Number.	Period of Mulching.	Moisture determined by Analysis.	Yield.
1. (*Check*)...	January ...	Not taken	Plot ... 458 lb. Acre ... 2,290 ,, Natural ... 2,290 ,, Percentage, 100
2.	Immediately after ploughing.	6 inches to 12 inches = 8·62 % 12 ,, 21 ,, = 11·89 ,, 21 ,, 30 ,, = 12·33 ,,	Plot ... 548 lb. Acre ... 2,740 ,, Natural ... 2,280 ,, Percentage, 120·1

PLOUGHED WITH DISC PLOUGH—*continued.*

Plot Number.	Period of Mulching.	Moisture determined by Analysis.	Yield.
3.	Just prior to planting.	6 inches to 12 inches = 7·07 % 12 ,, 21 ,, = 9·70 ,, 21 ,, 30 ,, = 10·52 ,,	Plot ... 426 lb. Acre ... 2,130 ,, Natural ... 2,270 ,, Percentage, 93·3
4. (*Check*)...	January ...	Not taken	Plot ... 452 lb. Acre ... 2,260 ,, Natural ... 2,260 ,, Percentage, 100
5.	November	6 inches to 12 inches = 9·19 % 12 ,, 21 ,, = 13·06 ,, 21 ,, 30 ,, = 14·34 ,,	Plot ... 608 lb. Acre ... 3,040 ,, Natural ... 2,298 ,, Percentage, 132·6
6.	December	6 inches to 12 inches = 6·92 % 12 ,, 21 ,, = 9·68 ,, 21 ,, 30 ,, = 9·94 ,,	Plot ... 527 lb. Acre ... 2,635 ,, Natural ... 2,336 ,, Percentage, 112·7
7. (*Check*)...	January	6 inches to 12 inches = 6·83 % 12 ,, 21 ,, = 9·39 ,, 21 ,, 30 ,, = 10·32 ,,	Plot ... 475 lb. Acre ... 2,375 ,, Natural ... 2,375 ,, Percentage, 100

PLOUGHED WITH DISC PLOUGH.

Mulched with Disc Cultivator.

1. (*Check*)...	January ...	Not taken	Plot ... 477 lb. Acre ... 2,385 ,, Natural ... 2,385 ,, Percentage, 100
2.	Immediately after ploughing.	6 inches to 12 inches = 8·1 % 12 ,, 21 ,, = 11·04 ,, 21 ,, 30 ,, = 12·45 ,,	Plot ... 605 lb. Acre ... 3,025 ,, Natural ... 2,360 ,, Percentage, 128·2
3.	Just prior to planting.	6 inches to 12 inches = 6·68 % 12 ,, 21 ,, = 8·67 ,, 21 ,, 30 ,, = 9·21 ,,	Plot ... 456 lb. Acre ... 2,280 ,, Natural ... 2,335 ,, Percentage, 97·6
4. (*Check*)...	January ...	Not taken	Plot ... 462 lb. Acre ... 2,310 ,, Natural ... 2,310 ,, Percentage, 100
5.	November	6 inches to 12 inches = 9·19 % 12 ,, 21 ,, = 13·06 ,, 21 ,, 30 ,, = 14·34 ,,	Plot ... 637 lb. Acre ... 3,185 ,, Natural ... 2,313 ,, Percentage, 137·6
6.	December	6 inches to 12 inches = 6·83 ,, 12 ,, 21 ,, = 9·0 ,, 21 ,, 30 ,, = 10·25 ,,	Plot ... 525 lb. Acre ... 2,625 ,, Natural ... 2,316 ,, Percentage, 113
7. (*Check*)...	January	6 inches to 12 inches = 7·37 % 12 ,, 21 ,, = 9·53 ,, 21 ,, 30 ,, = 11·695 ,,	Plot ... 464 lb. Acre ... 2,320 ,, Natural ... 2,320 ,, Percentage, 100

The Kangaroo Bot Fly

(*Œstrus macropi, n. sp.*).

WALTER W. FROGGATT, F.L.S., Government Entomologist.

In consequence of the rapid increase of the marsupials under close protection for some years, and the amount of damage they were doing to crops and grass last year (1912), an open season of three months was proclaimed, during which a large number of kangaroos were shot. In skinning these animals, Mr. Theo. B. Broughton, Moramana Station, in the Walgett district (where this proclamation was in force), discovered a number of short, white, semi-transparent maggots crawling about in the mucus on the windpipe (just below the mouth) of a large kangaroo. An examination of a number of specimens showed that a large number of the kangaroos were infested with this parasite of the windpipe, and through the kindness of Mr. Broughton a series of specimens of the larvæ in all stages of development was sent to the Entomological Branch. In some cases, only one or two maggots were found, but in a few as many as half a dozen were taken from one kangaroo. Though every care was taken in the collecting, packing, and forwarding of these lots, and in treating them when they arrived, though a few were alive, and apparently almost full-grown, none lived long enough to pupate to enable me to obtain the perfect fly.

In consequence of the very distinctive characters of the larvæ from that of the sheep nasal fly (*Œstrus ovis*), and the remarkable situation of the developing maggot, not in the frontal sinuses and nasal cavities of the head, as in the sheep, but in the windpipe, close to the throat, I have had a series of sketches made of this bot maggot, and propose for it the name of *Œstrus macropi*, the Kangaroo Bot Fly.

Though the adult fly is still unknown, it is pretty sure to be very similar in general structure to that of the sheep nasal fly, so I see no objection, in this case, to giving a scientific name to the most important form of the life history of the fly for the benefit of all workers in economic entomology.

Œstrus macropi, n. sp.—Adult larva; length, slightly over ½ an inch; breadth, ¼ inch. White, semi-transparent along the outer margins, very convex on the dorsal surface, with each segment distinctly rounded; under surface perfectly flat, with the surface of the eight central segments covered with fine transverse ridges of horny plates and fine spines. General form, elongate oval, rounded in front with the rather slender black recurved mouth hooks hidden under the cephalic or head segment. The first segment, small, encircling the head segment; the eight following segments deeply

impressed on the sides, with the divisions well defined; the tenth segment narrow, rounded behind, bearing the spiracles. This tenth, or anal segment, is transversely divided for about two-thirds of its depth in the centre, the basal side truncate, bearing two large irregularly rounded dark-brown plates, separated by a narrow vertical medium band; in the centre of these plates are situated the spiracles in the centre of a small boss; the apical half of the segment flat in front, and rounded behind, and in the live larva contracted or expanded at will, so that it can form a lid or covering over the spiracle plates. In preserved specimens, the structure becomes altered, the outer margins round the plates forming a raised rim, and the apical portion of the segment, contracting to rounded knob.

The Weed Factor in the Cultivation of Maize.

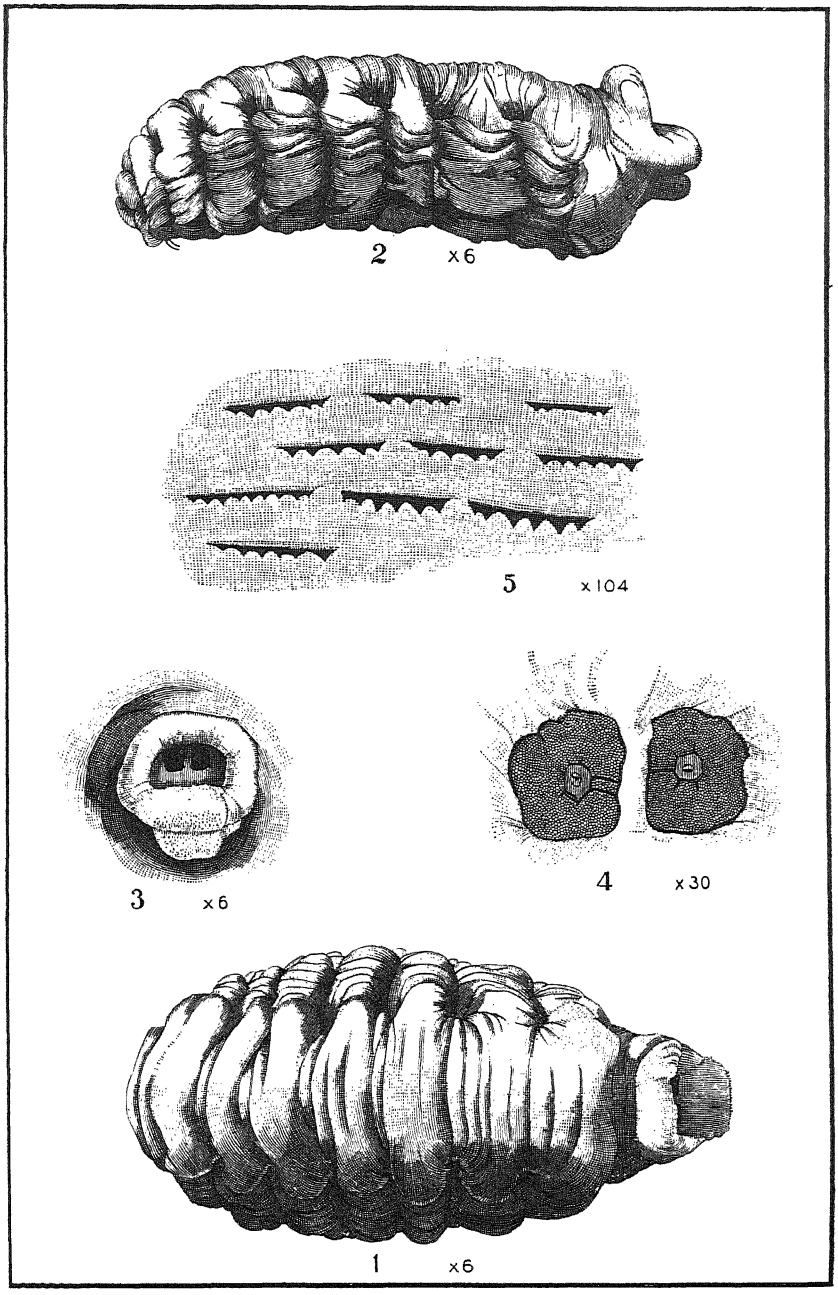
The United States Department of Agriculture reports, in Bulletin No. 257 of the Bureau of Plant Industry, results of 125 experiments, over twenty-eight States, conducted mainly between 1905 and 1911, to determine whether cultivation between the rows of growing maize is more beneficial than mere chipping off the weeds at the surface with a hoe. These experiments were conducted in co-operation with several State experiment stations and with farmers, many of whom were graduates of agricultural colleges. It was really a series of tests of mulching the soil against merely suppressing the weeds in the case of growing maize.

The general average of the results shows that the weeded plots produced 95·1 per cent. as much fodder and 99·108 per cent. as much grain as the cultivated ones. The United States Department concludes that "weed control becomes the principal object of cultivation; cultivation is not beneficial to the corn plant except in so far as removing the weeds is concerned."

The rainfall for the years of growth varied from 16 to 61 inches. In most cases it was from 30 to 40 inches. There was no great difference in the results with any particular rainfall. The experiments were also conducted in districts, both hot and cold, extending right throughout the United States.

Various causes are suggested for the fact that mulching—so beneficial in conserving moisture on fallows—should prove practically valueless to growing maize except in the suppression of weeds. For instance, it is pointed out that when the surface soil is occupied with a mass of growing roots, water drawn from below by capillarity would not be evaporated, but would be eagerly absorbed by the roots. Again, tillage mutilates the surface roots.

The Bulletin concludes with the recommendation that weeds be attacked (1) by the use of tillage implements, the primary purpose of which is their eradication, and (2) by adopting cropping systems having that object in view.



Larva (maggot) of *Œstrus macropi, n. sp.*

1. Larva (dorsal view).
2. Larva (laternal view).
3. Stigmata (capable of retraction within posterior segment).
4. Stigmata (enlarged).
5. A series of the transverse serrate plates of the body segments.

Rotation of Crops.

J. W. HADFIELD, Instructor in Agriculture, Hawkesbury Agricultural College.

ROTATION of crops is a systematic plan for the growth of crops over a number of years. Such a plan must necessarily be influenced by many considerations. Among these may be mentioned the maintenance of soil fertility, provision for live-stock, economy of labour, and general cost of production in proportion to the profits accruing. It is rarely possible for any hard-and-fast rules to be laid down when discussing the subject. Nobody is better qualified to decide upon his cropping plan than the farmer himself, when once he understands the underlying principles.

Cropping plans adopted in older agricultural lands with climates differing from our own, cannot often be reconciled with local conditions. The crops they grow may not be suitable, and their labour, machinery, seasons, and soils, enforce a certain routine which it would be disastrous to imitate here. The fundamental principles are, however, the same the world over, and it is in this that we may hope to learn from the study of their rotations, which, with the co-operation of manures and tillage, are the means by which they have maintained the fertility of land cropped for hundreds of years.

This practice of crop rotation is as old as agriculture itself, and the value of giving the land a rest or a change, has never been seriously disputed. Xenophon speaks of a two-year rotation of wheat and fallow, while Cato and Virgil tell of the alternate culture of grains and legumes. As the distribution of produce became more general through improved facilities for transport the tendency was for the rural worker to specialise in the one or few crops he was best able to grow, and to considerably increase the production. The continued growth of one crop caused the yields to become so poor, that periodical rests (fallows) were necessary. This may frequently have led to uncertain yields, and as a change of crop gave much the same benefits, advancement took place in the practice of adopting some definite plan of cropping.

Even now in newly-exploited agricultural lands much the same process is repeated. As the virgin fertility of the land becomes impaired, and the markets, trade, and population increase, so must there be improvement in crop management. Virgin land is turned over by the plough, and the harvests are all that can be desired. But as time goes on the particles of soil become finer, the soil turns over cloddy, it has not the drought-resistant powers it had in former times, and the yields are reduced. Manures may

play their part in checking this decrease, but they are often an expensive corrective, and alone may fail in time to restore to the soil its original cropping power.

One of the characteristics of the farming business is that the maximum production is rarely synchronous with maximum profits. Tenant-farming, unless special agreements are drawn up, is least conducive to rotation since the tenant may attempt to obtain every year the maximum production, disregarding the condition in which the land will be when his lease expires. Nevertheless, most tenant-farmers attempt some form of rotation, even if it is only to graze the land awhile after reaping several crops. Any rotation practised is usually spasmodic and follows no definite system. In most cases no endeavour is made to maintain the soil's productiveness, and it is not till it has shown the effects of its depleted fertility, that any attempt is made at reconstruction.

The benefits of rotation are universally appreciated, but there are many differences of opinion in respect to its practicability, and in the relative value of one course over another. As far as the soil is concerned, the maintenance of fertility is the chief factor. The settler starts with a certain amount of fertility which should be looked upon as capital, and he who fails to maintain this fertility, is drawing upon his capital as income. Any system that does not consider the future generations equally with the present is not based on good farming principles.

To organize a crop rotation, it is necessary to obtain a plan of the farm, and to subdivide the cultivation area, either actually or on paper into approximately equal sections. The number of crops or fallows included in the rotation will determine the number of these areas. Thus a rotation including two crops and a fallow, would necessitate the cultivation area being divided into three approximately equal parts. An exception to this occurs where double cropping is practised, and such is the case in many parts of New South Wales, especially the rich soils of the North Coast. If four crops are obtained in two years, it would then be only necessary to subdivide the cultivation area into two equal parts. At the same time it must be remembered that fresh grass-land could be put under the plough periodically, and old cultivated land put under pasture for a few years.

We speak of rotations as "two, three, or more course," according to the number of crops included before repeating the cycle in the same order. When subdividing land according to the number of courses, it may often be found an advantage to take up, or move the fence between adjoining paddocks. On the other hand, the subdivision of each of these areas may be of benefit in facilitating the grazing of fodder crops. Since it is often the aim when growing fodder crops, to maintain a constant supply over as long a period as possible, such subdivision allows of two or more sowings, and of convenience in feeding off. There are many crops that allow of only a limited cultivation, either because of market or labour conditions, or because

an excess of such a crop would be wasted. Thus in a subdivided area, and during a course of fodder crops, two or more kinds might be grown, making the area more productive throughout the year.

It does not often occur that a farm can be laid out systematically from its inception. The gradual growth of a farm year by year rarely results in everything being as convenient as it might be. It may even happen that the plan has become so inconvenient, that it would pay to remodel it at considerable expense.

Whatever the conditions may be when the farm plan is being discussed, attention should be paid equally to the convenience in rotation, as in laying out according to the topography of the land, and the general convenience of the traffic around the farm. These two questions, the farm plan, and the rotation, are so interwoven one with another, that the one cannot be dealt with fully, without bringing the other into discussion.

With large areas and cheap land, the pioneer's method of growing one crop year after year, caring nothing for future fertility, and allowing area to make up the deficiency in yields may perhaps be condoned, though it is certainly not good farming. But as the cost becomes higher, so must the yields increase. The land becomes more worthy of thorough tillage methods, intense cultivation results, and brings along with it the practice of rotating crops. Since we are rapidly passing out of the system of broad cultivation, especially in the wheat areas, the future of sheep and wheat farming will be closely wrapped up with the question of crop rotation.

It is pertinent here, then, to consider the main factors that will guide the farmer in his decision as to the most likely rotation for those conditions under which he is working. Briefly these are as follow:—

1. Labour, climate, and market considerations.
2. The destruction of weeds, diseases, and insect pests.
3. The action of shallow and deep rooted crops on the soil.
4. The maintenance of the best physical, chemical, and microbiological conditions in the soil.
5. The growing of fodder crops, and the area necessary for the maintenance of the stock on the farm.

These factors can be dealt with only from the broadest point of view, and the very mention of each should be sufficient guide to the practical man. The questions of labour, climate, and market are all self-evident. The profitable cultivation of certain crops will depend just as much on the question of available labour as on the suitability of the soil and climate to the crop in question. The market demand for the crop, or its value to the farmer himself, needs no comment.

From our standpoint, weeds and diseases may come in the same category. A single crop grown continuously entails the adoption of similar methods of soil preparation and cultivation year after year. Some weeds, through their

time of appearance or methods of growth, are able to avoid eradication under this continued treatment. If a second crop with a different seasonal growth, and necessitating different methods of cultivation, be grown, the probability is that these same weeds will be eradicated. The different time at which a crop is grazed or harvested, possibly preventing the weeds from seeding, or the growth of crops requiring intertillage, are both prominent factors in this respect. As a case in point may be cited the difficulty experienced by farmers on the Hawkesbury flats in eradicating the reedy grass. This is not damaged by the usual methods of cultivation given to maize and similar crops. The only hope of success is to lay down lucerne, when the regular cuttings will in time kill out the pest.

The characteristics which will enable a weed to avoid eradication are frequently present, and suit the plant to its environment Some are of opinion that such characteristics have developed under cultivation over an extended period of years. If so, we would expect weeds from older agricultural lands to be more common, and as a matter of fact this is so, and the worst and commonest weeds are introduced.

The mention of the following introductions:—Wire weed (*Polygonum aviculare,* L.), Barley grass (*Hordeum murinum,* L.), Sorrel (*Rumex acetosella,* L.), Cape weed (*Cryptostemma calendulacea,* R.Br.), and Couch (*Cynodon dactylon,* Pers.), corroborates this statement.

If the weed is hard to exterminate, the weed seeds in the soil are doubly so. It may frequently pay to alter plans respecting the use of certain crops with the sole object of preventing the weeds from seeding. No matter what trouble is taken with the growing plant, there is always a source of further trouble in the weed seeds lying dormant in the soil. Fallowing, thus enabling these seeds to germinate, and working the fallow to kill the young weeds is undoubtedly the best method of dealing with this problem.

There are many diseases and insect pests whose prevention, and possible eradication may lie within the scope of crop rotation. Those fungous and insect pests which attack only certain crops or families of plants will in time die out if there is no host for their maintenance. "Finger and toe" can thus be exterminated, while many troubles such as Irish blight, potato scab, loose smut, take-all of wheat, eel worm, black spot of tomato, and others can be very materially reduced, if not altogether destroyed, by careful rotation. It may happen that the disease lies dormant, or remains unobtrusively on plants in the vicinity, as in take-all. In the former case no host can be grown with perfect safety till the expiration of the full life of the dormant disease, though much shorter periods will be found to do a great deal of good. In the latter case the problem becomes even more involved and difficult to handle. The result of this may be to reduce the practicability of this method of eradication, but in no way to reduce its efficacy once it can be brought into operation.

Plants are equally characteristic in their root systems as in their growth above ground. Some enter the soil several feet, either by a tap-root or a system of fibrous roots. Such crops exploring the deep soil make use of its moisture, and render it more open; and certain plants, notably the legumes, may leave the surface-soil richer than it previously was. Others have fibrous, surface roots, and have not the ability to withstand a dry spell, though they frequently leave the surface in a better and more friable condition. Crops with different characteristics such as these should be grown alternately, wherever practicable. Rape and barley are characteristic contrasts in this respect, the former having a deep tap-root, the latter a very fibrous root system near the surface. Their value as a mixture lies not only in their suitability for grazing sheep, but also in their combined action on the soil.

The continued growth of one crop year after year will so impoverish the soil as to make it altogether unprofitable. The yield of wheat after being grown for several years in succession often falls below the profitable mark. Clover, turnips, mangolds, potatoes, tomatoes, tobacco, and flax are all crops that show in a marked degree the necessity for rotation. The reasons are various, and while in the case of wheat it may be due solely to the wild oat, what is specially desired to emphasise is, that the necessity for a change may be enhanced by the physical, chemical, or microbiological conditions of the soil brought about by the repeated growth of a single crop. As already stated, manures will mean heavy expense, and may fail altogether as a corrective, necessitating the land being turned into pasture for many years before it again becomes worthy of cultivation.

The successful growth of cereals in dry areas depends very largely on the conservation of soil moisture. This necessitates the absorption and retention of as much rain as possible, and sufficient time should therefore be allowed for a fallow to precede the sowing. Only under exceptional circumstances should the rotative crop be allowed to interfere in any way with the main cereal.

Finally comes the question of growing in the rotation crops suitable for the stock raised, and for conservation either as hay or as silage. These will naturally be carefully considered, and the value of each weighed before inclusion in the rotation. One course may have to include a succession of sowings, so that no material is left on hand to be wasted.

With such uncertain weather conditions as are experienced for the most part in New South Wales, any hard-and-fast system of rotation has been found difficult to adopt. A great deal of elasticity is required to enable the farmer to adapt himself to these changeable conditions. It necessarily follows that adverse circumstances will often upset the plans he has made, and his own initiative will decide the next best. In many other cases deviations must be made from the general rule. A rotation may include maize

and potatoes. The farmer may grow 30 acres of maize, but find 10 acres of potatoes as much as he can manage. So during the potato course the remaining 20 acres will have to be dispensed with by growing other crops, or allowing it to lie fallow. Assume that he uses it for crops by growing 10 acres of pumpkins and 10 acres of cowpea as a green manure, and that his full rotation covers two years. Then every year one of the paddocks is utilised for pumpkins, potatoes, and green manure. It would be inadvisable that these crops should be grown continuously every other year on the same 10 acres of ground, so that they themselves should, as it were, form a secondary rotation. The potatoes should be planted where the green manure was, and the pumpkins take the place of the potatoes. Considering just these crops mentioned, namely, maize 30 acres, potatoes, pumpkins, and green manure each 10 acres per annum, the rotation for any one 10-acre block will run as follows:—

1913	1914	1915	1916	1917	1918
Maize.	Potatoes.	Maize.	Pumpkins.	Maize.	Green manure.

As the markets change, the farmer will naturally desire to vary his crops, or to change the area they would ordinarily occupy. For many other reasons it is impossible in some cases to adopt an inflexible rotation. But while this is true, it does not in any way detract from the benefits of the system. It makes it a somewhat intricate subject, involving numerous problems, the solution of which, for the most part, will lie with the individual farmer.

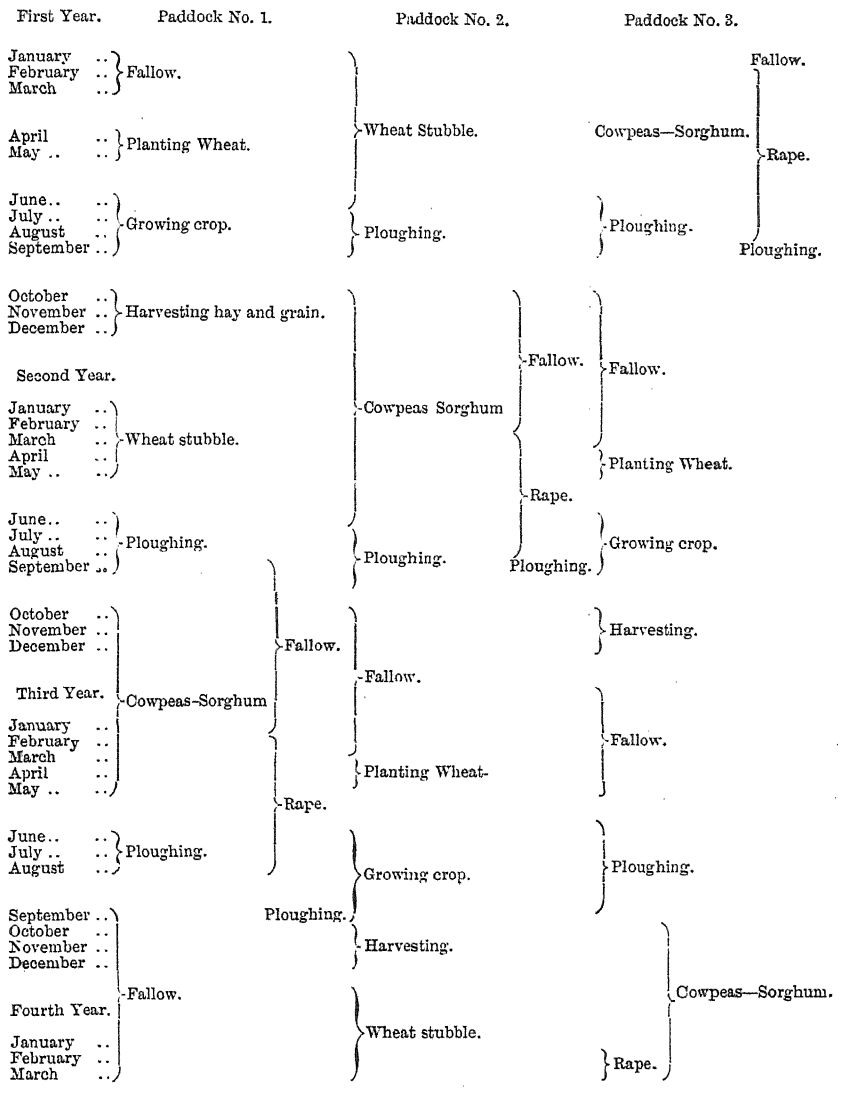
To facilitate a grasp of a rotation, it can be analysed, and the work involved systematically laid out over the full period during which the rotation is running its course. Mr. G. L. Sutton, in *Farmers' Bulletin,* No. 32, recommended the adoption of the following rotation:—

Wheat, Stubble, Forage Crop.

He has worked this out as follows:—

Year.	Paddock No. 1.	Paddock No. 2.	Paddock No. 3.
1st	Fallow Wheat	Stubble Fallow	Rape Cowpea Sorghum
2nd	Stubble Fallow	Rape Cowpea Sorghum	Fallow Wheat .....
3rd	Rape Cowpea Sorghum	Fallow Wheat	Stubble Fallow .....
4th	Fallow Wheat	Stubble Fallow	Cowpea Sorghum Rape

A TABLE of the Farm Operations and Cropping during the course of the rotation:—



As a second example, let us take the rotation adopted by Mr. Haywood at the Grafton Experiment Farm. Since it is a case of double cropping it will be somewhat different to the above. The rotation covers two years and consists of

Potatoes, cowpeas, wheat, maize.

This will necessitate two paddocks. The table of operations for cropping and harvesting will be as follows:—

Year.	Paddock No. 1.	Paddock No. 2.
First Year—		
January		Cowpea.
February		Cowpea.
March		Harvest.
April	Maize.	Sow.
May	Maize.	
June	Harvest.	
July	Plant.	Wheat.
August		Wheat.
September ...	Potatoes.	
October	Potatoes.	Harvest.
November ...	Harvest.	Sow.
December... ...	Plant.	
Second Year—		
January	Cowpeas.	Maize.
February	Cowpeas.	Maize.
March	Harvest.	
April	Sow.	
May		
June		Harvest.
July	Wheat.	Plant.
August	Wheat.	Potatoes.
September ...	Wheat.	Potatoes.
October	Harvest.	
November ...	Sow. Maize.	Harvest.
December... ...	Maize.	Sow. Cowpea.

LOCAL ROTATIONS IN NEW SOUTH WALES.

[To make the subject of wider interest, the managers of the various Experiment and Demonstration Farms have been asked to supply a few notes on crop rotation, both on the farm they have under their management, and also in the district generally. These answers afford a good comparison of rotations suited to widely different districts.—Ed.]

WAGGA EXPERIMENT FARM.

G. M. McKEOWN, Manager.

Rotation of crops is practised only to a limited extent on the South-West Slopes and in the Riverina.

The practice is either to crop continuously with wheat, or to crop with wheat in one season and bare fallow the land the next, the land being worked in the intervals between crops to conserve moisture.

Some farmers sow wheat in one season, oats in the following year, and in the third year the land is fallowed.

This method is a more profitable one, as two crops are harvested in three years instead of two in four years, and the alternation with oats and fallow respectively reduces to a minimum the liability of crops to some of the diseases to which they are subject, especially Take-all.

The methods tested at the Experiment Farm are as follows, viz.:—

1. 1st year—Wheat for grain.
   2nd year—Green cereal crop (harvested).
   3rd year—Fallow.
2. 1st year—Wheat for grain.
   2nd year—Wheat for hay.
   3rd year—Bare fallow.
3. 1st year—Wheat for grain or hay.
   2nd year—Bare fallow.
4. 1st year—Wheat for grain.
   2nd year—Barley.
   3rd year—Bare fallow.
5. 1st year—Wheat for hay or grain.
   2nd year—Self-sown pasture consisting of cereals, grasses or herbage.
6. 1st year—Wheat for grain.
   2nd year—Leguminous crop fed off and residue ploughed in.

The crops have been cut by a reaper and binder, and the stubble, which in the case of grain crops is of a fair height, after being grazed by stock, ploughed in. Stubbles are ploughed with discs as soon after harvest as is practicable.

Nos. 2 and 4 have so far proved the most profitable methods. No. 5 has not proved so successful as was expected, the crops always being lighter than those harvested from land differently treated. Since the growth of the leguminous crops has been discontinued and bare fallow substituted, there has been a marked improvement in cereal crops.

No. 6. The improvement in pastures and consequent stock-carrying capacity of the land has been very marked, but owing to the land having been used as long as possible for pasture purposes it was not ploughed for the succeeding crop as early as otherwise would have been the case.

Under these conditions the crops are not as satisfactory as would be the case if the pasture period were curtailed, and the land ploughed early, in order to admit of greater receptiveness and retentiveness of moisture.

BATHURST EXPERIMENT FARM.

R. W. PEACOCK, Manager.

The rotation followed on this farm is a two-course system, wheat alternating with a fodder crop for sheep. The fodder crops comprise barley and rape, or oats and rape sown in alternative drills. These provide considerable fodder for five months of the coldest portion of the year, and provide pasture for from five to six sheep per acre for that period. In the spring the sheep are taken off, and the crops allowed to grow, and before any seed

is formed they are ploughed under about the end of October or early in November. The crop residues add organic matter to the soil, and keep it in excellent condition to receive and conserve the rainfall of the short bare fallow of five months before the sowing of the main cereal crops in April. This system has frequently allowed of 40-bushel wheat crops being harvested.

The above refers to the main practice in which sheep are catered for in addition to the growth of the main cereal crops.

Other crops which may be grown commercially and fitted in as secondary crops are lucerne and maize. These may be worked into a rotation as follows:—Lucerne for grazing and occasional cutting, according to conditions, upon the wheat or uplands, for four or five years. The land is then broken up in the autumn to allow of the lucerne being readily killed by ploughing in the dry weather. Plant the maize in spring after about seven months' fallow. Follow with oats for hay, then sow fodder crop and afterwards wheat. The rotation would then be

Lucerne (four or five years), maize, oats, fodder crop, wheat.

In relation to the above a fodder crop is sometimes sown between the drills of maize in early autumn. After grazing it is ploughed under with the maize stalks in the spring, and is followed by a main cereal crop next autumn.

A modified rotation is sometimes adopted thus:—Fodder crop and five months' fallow, followed by a main cereal crop. Plough as soon as crop is off, allowing several months fallow, and sow oats or wheat for hay. It will be noted that only one crop is grown in one year and the practice of a short fallow preceding main crops is adhered to.

COWRA EXPERIMENT FARM.

MARK H. REYNOLDS, Manager.

The results so far indicate that a winter fodder crop of rape preceding the wheat crop gives the best results where the land is ploughed up as soon after harvest as possible. The rape is sown in February, March, or April, in rows 3 feet apart, cultivated twice during autumn and spring, and ploughed under before seed has formed. Slightly better results have been obtained by this treatment than from bare fallowing.

In general practice on the farm the rape is fed off three times until early in November, and the residues then ploughed under. After each feeding off the cultivator is run between the rows. Next season sections of rape will be fed off, and others ploughed under, to ascertain the relative merits.

Cowpeas likewise show promise in the experiments as a rotative crop, and yearly large areas are sown, sheep feeding off and thriving on this crop.

Although it cannot be definitely stated, results so far indicate that the effect on the succeeding wheat crop is controlled by the cultivation given to the land. For instance, the rape crop ploughed under in the spring, and the land given a further ploughing at the time the cowpeas were ploughed under in the autumn did not yield so well as the cowpeas. But where the rape was ploughed under in the spring, and only shallow moisture-conserving cultivations given until wheat seeding in the autumn, better yields were obtained. Much depends on whether the autumn rainfall is light or heavy. This affects materially from one season to another the yields from late autumn ploughed land.

But as far as results show at this farm, autumn ploughing just before seeding wheat, is not a good practice.

Vetches, another winter fodder crop, have shown up well in the experiments, likewise peas. By an experiment shortly to be started the relative merits of rape, cowpeas, vetches, and peas will be more accurately gauged.

This season rape and barley were sown over the demonstration and certain experiment areas, in alternate rows 14 inches apart. Only a light sowing of barley was made on account of the amount of self-sown wheat, which is always present when a crop is stripped. This combination did well. It should be pointed out, however, that it is not advisable to sow barley over large areas because a few hot days in early spring cause it to head out, and sheep, especially merinos, seldom eat the ear, with the result that the crop has to be ploughed under earlier than one would like, to save the barley grain from maturing.

A preliminary trial was made of a small plot of Thousand-headed kale which up till 26th November, 1912, had not run to seed, whereas the rape was in flower a month before. The kale had made an excellent growth considering the dry hot spring, having a spread of 3 feet and 3 feet high, and warrants a more extended trial next season.

In the past, little has been attempted with maize and sorghum at the farm; but this season some 50 acres have been sown with a wheat drill, in drills 3 feet 6 inches apart. The crop has been harrowed and cultivated, and is some 2 feet high. Should the crop fail to give a satisfactory cut for silage it should produce good feed even if the weather remains dry, and due to the cultivating given the land, will produce a satisfactory crop of wheat. Should a rainy season follow there is the possibility of securing both a good silage and grain crop. If the crop is left for grain a reduced yield of wheat would follow, due largely to the necessity of ploughing the land close to the wheat sowing.

Local farmers are not, as a rule, systematic in rotation. A few grow rape and cowpeas alternating with wheat. A large number fallow a section each year varying from half to one-twentieth of the area they purpose sowing. Some few grow small areas of maize and sorghum on the high lands.

The value of oats following wheat is especially apparent in areas where take-all has shown in preceding crops of wheat. The safest way to deal with the oat crop is to cut it for hay or for threshing, because any seed shed may not germinate until the succeeding crop of wheat is sown, should the autumn rains be light in character.

HAWKESBURY AGRICULTURAL COLLEGE.

J. W. HADFIELD, Instructor in Agriculture.

Two rotations are followed on the College farm, depending on the distance the paddock is away from the farmstead, and whether it affords convenience in carting silage crops. For this latter purpose maize is chiefly grown, and only those areas showing good promise are allowed to mature for grain.

1. With silage crop.

Wheat or oats, fodder crop, maize.

The use to which the maize is put will determine whether this rotation will take two or three years. If it is harvested for silage by January, the land can be ploughed and cross-ploughed in time for planting wheat or oats the same year.

2. Without Silage Crop.

Wheat, oats, fodder crop, wheat, oats, graze for a few years.

There is little or no arable farming in this district conducted on soil similar to that at the College.

The College farm on the river flats is principally under irrigated lucerne. The blocks are of different ages, and about every five or six years they are ploughed up and put under general cultivation. The last lucerne plot to be ploughed up has been rotated as follows:—

3. Potatoes, forage crops, maize.

This occupies two years, and the forage crop, usually barley and vetches, is fed in a green state to stock. The time under lucerne very materially assists in getting rid of the maize smut, and the common reedy grass, which is otherwise found to be one of the most difficult weeds to eradicate.

Another rotation suitable for the river flats:—

4. Maize.

Potatoes, tomatoes, &c.
Wheat or oats for hay; barley for green feed.
Pumpkins, melons, &c.

As pumpkins, melons, &c., are not likely to take up the same area as maize, they may be included in the potato course, making the rotation cover two years instead of three. This will then become—

5. Maize.

Pumpkins, melons, tomatoes, potatoes, &c.
Wheat or oats for hay; barley for green feed.

A paddock of lucerne should be constantly maintained. As the block becomes worn out, a fresh cultivation paddock can be laid down to it. When the young crop has got a good stand, the old block can be either broken up or turned into a grazing paddock. One of the previous grazing paddocks then comes into cultivation.

The farmers on the bottoms are very largely dairymen, with whom cultivation is a secondary consideration. Much less area is put under crop than was formerly the case. Lucerne and maize are the chief crops, besides which smaller areas of pumpkins, potatoes, tomatoes, cabbages, turnips, and swedes are grown for sale. Oats, barley, and wheat are grown for green feed, and a little for hay. With perhaps the exception of maize, there is usually some attempt made to change the land the crop is to occupy, but any systematic rotation the majority consider impracticable.

WOLLONGBAR EXPERIMENT FARM.

J. G. McMILLAN, Manager.

The original method adopted in clearing the land in the Richmond River district consisted principally in cutting the scrub a few inches under the ground, then burning off, and subsequently sowing paspalum and white clover seed without any cultivation. When *Paspalum dilatatum* was first introduced, it was thought by many that an inexhaustible pasture would be obtained. Therefore very little if any attention was given to crop rotation. Now, however, owing to the matted condition of the paspalum paddocks, it is absolutely necessary for a proper system of rotation to be adopted in order to keep the grass in check, and also to fertilise the ground.

At the Wollongbar farm a certain amount of change has been made in the system of cropping, but this cannot be termed a true system of rotation, as the crops from year to year consist principally of those belonging to the one botanical order. The reason for this might be explained in the difficulty of breaking up new pasture, and also in the limited variety of the different botanical orders of plants that can be grown in the district. The system which has been in vogue has been principally, after breaking up the pasture —First, to grow broadcast a crop of planter's friend or maize with cowpeas, followed by wheat or oats, sweet potatoes, &c. These kinds of crops are sown for several years, being green manured once with rape or cowpeas, before the land is again laid down to pasture. A rotation well adapted to the district, and one that we intend carrying out at Wollongbar, is as follows:—

After breaking up the paspalum land in the winter, the following crops will be grown, which here means two crops in the year:—

(*a*) Spring. Planter's friend, with cowpeas, broadcast.
(*b*) Autumn. Wheat, oats, or rye, with vetches.
(*c*) Spring. Maize for grain, or sweet potatoes.

(*d*) Autumn. Wheat or red clover for hay, black winter rye (grazed off), or rape (ploughed in).

(*e*) Spring. Planter's friend, with cowpeas broadcast.

(*f*) Autumn. Black winter rye with vetches or oats, at the same time sowing the following mixture:—Perennial rye, 20 lb.; cocksfoot, 5 lb.; prairie grass, 10 lb.; white clover, 4 or 5 lb.; and red grass, 2 lb. per acre.

Reviewing these in their order:—

(*a*) Planter's friend with cowpeas assist in checking the growth of the paspalum. This forage crop can either be used for ensilage or green feed for cows.

(*b*) The wheat or oats can be grown for hay, but either the latter or black winter rye can be most profitably utilised by allowing cows to graze on the crop. The vetches, of course, in addition to making a better-balanced food, add to the fertility.

(*c*) Maize for grain, and at the same time cowpeas, can be grown for seed purposes. The sweet potato is one of the most profitable feeds, and can be fed off with pigs.

(*d*) Wheat or red clover can be grown for hay, the oats or rye grazed, as in No. 2. If rape is the crop preferred, then that can be ploughed in, or even utilised for feeding pigs.

(*e*) Planter's friend with cowpeas again used for ensilage or green feed.

(*f*) The rye sown immediately after ploughing, then harrowed, and the grass seeds sown and lightly covered. The advantage to be derived from such a practice is that the rye is fit to be grazed off by cows in about two months' time, thus allowing of an excellent succulent feed during the winter. It also acts as a nurse crop to the young grasses.

As previously mentioned, very few of the farmers in the district adopt a system of rotation, planter's friend, oats, maize, and sweet potatoes being the only kind of crops grown. It is seldom that legumes are sown amongst the former crops.

GRAFTON EXPERIMENT FARM.

A. H. HAYWOOD, Manager.

The following rotation is in operation at this farm, and has been found very satisfactory, four valuable crops being procured in two years:—

Potatoes.—Plant July or August, harvest November.

Cowpeas.—Plant November, harvest March.

Wheat.—Plant April, harvest October.

Maize.—Plant November or December, harvest June.

There is considerable latitude regarding the disposal of the cowpea and wheat crops. For example, cowpeas may be either ploughed under as a green manure, fed off to stock, cut for hay, or left to mature its seed. Wheat may be profitably used as a soiling crop, grazed, or left for hay or chaff.

This is the only rotation recommended.

Practically no rotations are adopted systematically by district farmers. Maize may follow potatoes, but in the majority of cases maize is grown for years in succession.

The tenant system is fatal to good farming in this district, especially with respect to rotation.

GLEN INNES EXPERIMENT FARM.

R. H. GENNYS, Manager.

The rotation most suitable for this farm is a two-course, consisting of—

(*a*) Straw crop, maize.

(*b*) Straw crop and red clover, second year's growth of red clover for pasture or hay.

Another rotation suited to the district is a four-course, comprising—Straw crop, maize or potatoes, straw crop and red clover, second year's growth of red clover for pasture or hay.

There are only a fair number of farmers who practise any rotation, which generally consists of—

Straw crop, maize, or potatoes (where soil is suitable for tubers).

As red clover is now being grown by some with their straw crops, in time it may become part of a systematic rotation, as it can well keep up the supply of nitrogen and humus, besides being a valuable hay and grazing plant.

NYNGAN DEMONSTRATION FARM.

H. J. KELLY, Manager.

The rotation which has so far proved most suitable at Nyngan farm is a three-year old course, comprising:—

1st, wheat; 2nd, fodder crop of either rape or cowpeas; 3rd, bare fallow.

The inclusion of both rape and cowpeas in the rotation is necessary, for, in addition to the benefit to the land from the growth of such crops and the subsequent feeding off by stock, thus returning humus to the soil, provision

is made, as far as possible, for a continuous supply of succulent fodder. This, during dry periods, when the natural pastures become so dry as to be insufficient in themselves to sustain stock in fair condition, would be of immense value to the provident settler, who had thus made provision for dry times.

It is therefore obvious that of a given area devoted to agriculture, the portion to be planted each year with the fodder or renovating crop, should be divided, one half sown with rape, and the other half planted with cowpeas later on in the season.

This, as an agricultural district, is still in its infancy, and but little experimenting has been done in this direction. Some minor experiments are, however, being conducted at this farm, and it is hoped that other plants will be found to withstand the weather conditions sufficiently to be included in the rotation. Practically no crop rotation is practised by any of the district farmers.

Working Black Soils.

In reply to a correspondent at Baan Baa, as to the best way to work black soils for wheat, the Acting Under-Secretary and Director of Agriculture said :—

Our experience in connection with the working of black soil has been that in most instances the first ploughing should be deep—say, from 5 to 6 inches, and in some cases it is preferable that the second ploughing should also be deep.

Subsequently, as a rule, the best results are obtained with shallower cultivation. I am inclined to think that under certain circumstances the working of the land to a depth of from 3 to 4 inches with the one-way disc cultivator would give the best results.

The principal matter in connection with the working of black soils is to keep them from setting, and to prevent this it requires more frequent cultivation than red soil.

Wheat is really a deep-rooting plant, and in many soils the roots will go to a considerable depth. If, however, the wheat plant obtains a good start on the black soil, it has apparently little difficulty in penetrating to a depth, as the natural cracking of the black soil acts in a somewhat similar way to sub-soiling.

As a rule, I would advise sowing a little more thickly on the black soils than on the red—say, about 40 lb. per acre for early sowing up to 60 lb. per acre for late sowing. In the Baan Baa district early sowing generally gives the best results, and, unless wheat is well advanced in the spring, it is very liable to burn off on the first approach of hot weather. Usually red soil can be sown later than black.

First Impressions of a Dairy Instructor.

F. WIGAN, Dairy Instructor.

THE district into which I was sent to start instructional work comprised the valleys of the Hunter and Williams Rivers, and is well known for its highly productive river lands. In most places it is eminently suitable for dairying pursuits, except, perhaps, for some low-lying and swampy country which does not produce the highest quality of milk and butter. One cannot help noticing, however, that the best lands are given up to the cultivation of lucerne, which, doubtless, pays much better than milk production on such high-priced country; and one is also struck with the absence of fences on the farm boundaries, showing how every available piece is utilised for growing this excellent fodder plant. Leaving these best lands, and getting into the more hilly country, we come upon the chief dairying lands, and these mostly have a lucerne paddock or two to help through the times of shortage.

Taking the farms as a whole, I should say that they have a very fair grass covering during the greater part of the year, except in parts, perhaps, in the very hot dry weather, when everything gets burnt up, and hand-feeding is absolutely necessary. As these parts enjoy rather mild winters, it appears that the winter should be their best dairying season, when the feed is fresh and green. There is a great variety of farms and holdings in this district, from the man with just a few cows to large estates running hundreds.

Cattle Returns.

Up till now, at any rate, there seems to be very little effort at keeping a record of the actual returns from the cows milked, except, of course, in very isolated cases, where the man at the head of affairs takes the trouble to weigh and test and so find out exactly what he is receiving from his cows. One cannot but wonder at the smallness of the number of dairy-farmers who know the returns they are getting from their cows for, say, the last two months, or even for the year, let alone give any information as to the actual production of the individuals which comprise their herds. Recently, however, some of the more progressive men, acting on advice from the Department, are forming Co-operative Herd-testing Societies, for the purpose of ascertaining the actual butter-fat production of each cow in the herd, extending over a period of nine months, with a view to disposing of those cows which do not give an adequate return of profit over actual cost of keep. This cost of keep seems to be a hard matter for the farmer to realise and figure out, but until he does so he can never be in the position to

carry on to the best advantage or to know what profits his dairy is returning for the labour and capital involved. The farmers are not dairying for fun, so there is no reason why they should not inaugurate business methods by starting at once to test the cows and cull according to results.

Cattle Improvement.

One is also struck with the absolutely chance methods, or rather, want of method, exhibited by many farmers in the improvement of their herds. The dairymen's best cows will be in the future his own heifer calves, properly reared, for not many want to part with their best cows except at a clearing-out sale. The only true way to improve our dairy herds is to breed and rear heifers which are better than their mothers were. It is difficult to find a man with a fixed ideal type at which he is aiming in breeding, and consequently more often than not he does not have the right type of bull for the cows of his herd. In addition, he changes his bulls too often to get any definite fixed result, and consequently his heifers are disappointing to him. Then, of course, there is the man who makes no effort at improvement by thinking beforehand, but just purchases a bull; it may be crossbred or mongrel as long as he is a bull. Naturally, such a man fails to raise the standard of his herd. Looking at the farms and buildings, it is often the case that the site is by no means the best available, and in many cases it would be profitable to spend a few pounds on a windmill, and supply clean water to the dairy for washing and cooling, and into troughs for the cattle. So far there is little effort at the growth and conservation of fodder for dry times. I wonder what some of these men would say if they saw the many up-to-date brick and cement silos at Tilba on the South Coast. How many cows are fed and cared for when dry just as diligently as when in milk I did not see, but it is obvious that cows fed at this period and kept in good condition mean more to the farmer than he actually realises. This feed shows splendid results in the following milking period.

Dairy Buildings and Cleanliness.

One cannot fail to notice the poor equipment on most dairies to facilitate the proper washing up of all utensils, separators, &c., and in very many cases the total absence of the dairyman's friend, the scrubbing-brush; in its place one sees an old dish-cloth, ill kept. Much educational work evidently remains to be done to teach the all-important part which bacteria and germ life play in the good quality or otherwise of all our dairy products. Taken all round, there is an absence of that elementary knowledge of germ life which is most essential in the production of a high-class butter for the English and other markets. One cannot but feel the greater need for this knowledge as the introduction of milking machines progresses in the various districts, for here we have an extra breeding ground which needs the greatest attention at all times, and tells its tale each day. We have also

the fly to combat, and numberless creams are exposed to the influence of these little germ-spreaders. I was greatly struck with the number of cream-coolers in the dairies in one particular district, which are all out of use, and have been put aside. There we have the farmers actually in possession of an appliance which, if used regularly and properly, would improve the quality of their cream to an enormous extent, yet they discard them as being too much trouble to use. In other districts cream-coolers are quite unknown in the dairies. When we can get the farmers to realise the importance of checking germ growth by means of these coolers, as the cream leaves the separator, the standard of our creams will be greatly raised, especially in districts where the cream is held for many hours before despatch to the factory. A question one may be disposed to ask is: "Why use 10-gallon cans for cream?" Many of our dairymen send along one can each time the cream van calls, *i.e.*, three times a week, and in remoter parts twice in the winter. Now if this cream were split into two lots, keeping the stale cream for one can, and the fresher cream for the other, and if 5-gallon cans were used, the factories would be given a chance of making a fresher article. Then, again, a 10-gallon can often arrives at the factory only half full, and what a hot stuffy air arises from this can when first the lid is removed! The same cream sent in a small full can would keep much better and produce a superior butter. Ten-gallon cans appear to be only a custom, and used simply because a man cannot handle a much greater quantity at a time. One will also remark the number of very old cans with very little tin left on their surfaces still kept in use.

A good deal of improvement would result if more care were given the creams after they leave the dairies, for primitive protection is often afforded the cans whilst waiting on the roadside for the cream van to pick up, especially in the very hot summer days. Very often these cans are taken from the dairies and placed there many hours too soon. In some cases people rely upon the factory to do too much for them, more particularly those who live near the factory, and leave their cream for the van to get three times a week, when it would be a great advantage to all concerned to run it just the couple of miles to the factory each day especially in cases where they have 10 to 20 gallons daily.

The thing which impressed me most throughout the districts referred to was a number of cases of extreme uncleanliness in certain dairies, and in some cases it has been necessary to report finding the dairies, separators, and utensils in a very dirty condition. These people continue in the same state until they think the inspector is coming along, and unfortunately his visit is anticipated by a general clean-up and lime-washing of premises. It has happened that the local papers have published the arrival of the dairy inspector in the town, and, of course, the news passes from one farm to another. In this way these people, to a large extent, escape his notice, and it must be understood that he does not get a chance to see them much more

often than once in eighteen months. However, no one is aware of the appearance of a dairy instructor in a district, and I only visit those dairies sending second-grade cream to their factory. Thus it is possible to see the dairies in their ordinary every-day state, which, as already stated, in some cases is very bad indeed. The separator has been, and is a great source of contamination in these second-class dairies, and now we have an additional danger to contend with, viz., the milking machines. One must be more than impressed, even quite alarmed, at the frequently dirty state of most of the milking machines on the farms, and it is regrettable that these modern labour-savers have in the majority of cases greatly reduced the quality of the milk and cream drawn by them. In this matter the whole fault lies in the carelessness and inattention of the farmers themselves. It has been proved that, with proper and careful handling, the machine-drawn milk is equal to and better than the hand-drawn, but the great drawback to milking machines is that they readily lend themselves to the careless producer. Many adopt the policy of "anything to get through the work, and never mind about the machines." The rubber tubes and teat cups are allowed to get filthy, and in many cases are used long after they have served their fair term. These rubbers must be always kept sweet and clean, and new ones substituted when a reasonable amount of wear shows in the old ones. It is to be hoped that the farmers will follow advice given freely to them in handling these machines, otherwise we must be afraid for the future. And it is worth while again advocating the use of scrubbing brushes in all dairy work, and less reliance in patent cleansers in the water, however useful they may be in their way.

Factory Methods.

With regard to the factories, what struck me most was the lack of uniformity in carrying out the general factory work, and in many cases the "make haste or get through as quickly as possible method" at the expense of the finished article. A glance at their butter grade slips will show how the product suffers from this. In some cases the inadequate appliances are responsible for some of this, also the butter is worked and churned a little more quickly under these slipshod methods. There also appears to be no set standard for their first-grade butter, and it was surprising in some cases to see the amount of cream that would not make even a 90-point butter, which was tipped into the first-grade vats. The management apparently relied upon the quick disposal on the local market to have this butter consumed before it had time to develop a bad flavour. I can, however, testify to their error of judgment in this respect from the butter I got on some of the local hotel tables. There is no effort at high-standard butter under these conditions, and there appears to be plenty of room for three grades, especially at factories receiving creams from long distances and at protracted intervals; pay to be according to quality, of course.

Creams arriving in the hot summer days are weighed, sampled, cooled, and run into vats in a cream-room, there to await churning on the following morning. In many instances no means are available and no steps taken to control the temperatures of either the cream-room or the cream whilst it awaits the churns. I have seen cream from these vats entering the churns in the morning at 68 degrees F., in the summer time. This must impress anyone who understands butter-making. Special cream cooling rooms are desirable, and it is a wonder there are not more factories with such conveniences.

There seems to be a great desire to work the locally-sold butter with as much water as possible, always, of course, within the 16 per cent. limit; and there is a general movement towards the adoption of combined churn and workers.

A feature that is evident amongst the men in the factories is the good effect the Government dairy science schools have had upon those who have been able to attend these classes, both as seen in their work and also the interest which the knowledge gained at these schools has aroused in the scientific side of butter-making. One manager, at any rate, in my district, who, from what he learnt at one of these schools, is able to make, and has made, the media required for "plating" creams, butters, &c., and who has now some plates of different creams, with a view to ascertaining the creams most suitable from a bacteriological point of view for making a good keeping quality butter.

Chloride of Lime for Purifying Water.

In the *Agricultural Gazette* for June, 1912, Mr. C. J. Woollett, called attention to an article in the *Journal of the Royal Army Medical Corps* by Dr. G. Nasmith and Dr. R. R. Graham, suggesting the use of chloride of lime for the purification of polluted water.

In order to thoroughly test the method, a lengthly series of experiments was undertaken at the Bureau, the results of which indicate that chloride of lime has unquestionably a high potency as a destroyer of noxious bacteria; they show that one part of chloride of lime to a million parts of water should eliminate entirely if present in small numbers; and if present in large numbers it may likewise destroy them all, and at any rate will materially reduce their numbers.

Though, unquestionably, chloride of lime is a powerful germicide for practical purposes, it should only be used in emergencies. If water required for drinking, or for washing food or dairying utensils, is supposed to harbour typhoid or other harmful bacteria, our opinion is, unquestionably, that it should be boiled.

The golden rule is, boil the water whenever you can—when this is impossible, chloride of lime is good.—Bureau of Microbiology.

Black Oats.

Considerable discussion has been caused amongst farmers in some districts by the results published in the May issue of the *Agricultural Gazette*, in connection with continuous wheat-growing at Cowra Experiment Farm. An impression has been created in a few minds that the Department is quite unable to cope with the pest.

A close examination of the article in question will indicate how clearly it refers to the fact that Black Oats and Saucy Jack have only taken possession of the area on which wheat has been grown continuously for the past seven years. With the exception of that portion of the land actually adjoining the continuous wheat crop, the farm has remained comparatively free from Black Oats. As the manager of the farm stated, the spread of Black Oats on the land is either the inevitable result of growing wheat each year, or that the cultivation methods are faulty.

At first sight it would appear that the result was brought about by faulty cultivation, but, as a matter of fact, this experiment was planned and carried out by the Department with the deliberate object of demonstrating that one of the chief disadvantages of continuous wheat-growing is the Black Oat trouble.

It will be noticed in the report that during the first three years no Black Oats were present, but that after this, till the seventh year, they were very prevalent.

The experiment has once more confirmed the departmental opinion that in wheat-growing districts it is absolutely essential to either fallow the land or to alternate the wheat with a suitable fodder crop.

References to various aspects of the Black Oat trouble may be found in the March issue, page 203; April, page 332; and June, page 476, all of 1911.

One of the best methods of ridding the land of the pest is a long fallow from the winter of one year to the autumn of the next. Cultivate the land shallow at first, and allow any oats on the surface to germinate. Then plough the greatest depth it is decided to cultivate and let each subsequent cultivation be more shallow. Provided there is an average rainfall, this practice will eliminate, or at least materially reduce, the Black Oat pest in most localities.

In addition, it is of course necessary to exercise the utmost care in ensuring the purity of the seed used, and in feeding the farm stock on nothing but oat-free fodder.

Algaroba (*Prosopis juliflora*).

Mr. J. H. Maiden, F.L.S., Government Botanist, would be glad if readers of the *Agricultural Gazette* to whom he distributed seed of this fodder tree in the year 1904, will be good enough to report the results of the experiment

Maize.

[Continued from page 330.]

A. H. E. McDONALD, Manager Coonamble Experiment Farm.

THE SELECTION OF SEED MAIZE.

It is regrettable that as much attention is not given by maize-growers to the selection of good varieties and to the improvement of seed as is given by their wheat-growing brethren. During recent years the growth of improved varieties in the experiment plots of the different maize-growing districts has been the means of arousing a good deal of interest in the subject, and the continuance of this practice will no doubt immensely benefit the general farmer. Assisted by the fact of the Department of Agriculture supplying seed for the experiment blocks a few leading maize-growers are gradually becoming specialists in seed maize production. A splendid field for enterprising men exists in this direction provided the proper course is followed. Demand can only be created by supplying seed of high quality. No market for seed maize will ever be created if seed that is of a mixed character and little better than feed corn is supplied. Confidence in a seed-supplier is only to be secured by the high quality, and especially the purity of the ancestry of the purchased seed.

It is desirable that every farmer who raises seed, whether for his own use, or for sale, should practise a rigorous system of selection. An enormous loss must occur annually through growers neglecting to sow good seed of the variety that is best suited to their special conditions. A rough estimate may be obtained from the results of experiments made on the North Coast during 1910-11 and 1911-12. In the season 1910-11 at Mundrook and Stewart's River, Yellow Dent, one of the best varieties known to the Department for that district, averaged 47 bushels 7 lb. per acre, while the local variety averaged 45 bushels 26 lb. or 1 bushel 37 lb. less per acre.

In 1911-12 the difference was greater, the average from seven trials of Yellow Dent on the North Coast being 54 bushels 34 lb., while the local variety in five trials averaged 49 bushels 15 lb., the difference in favour of the improved variety being 5 bushels 19 lb. The loss of even one bushel per acre is an enormous penalty for a farmer to have to pay for neglecting to ascertain and sow the best variety.

As a remedy for the deplorable state of affairs existing in regard to seed maize-farmers are recommended to watch carefully the experiments which are being made by the Department of Agriculture. It is preferable for farmers to take the results of these experiments as a basis than to make tests themselves, because the Agricultural Department is in a position to obtain good

seed and to make accurate tests. It is also essential that farmers should follow the experiments that are being made in their own particular section of the State.

Having ascertained what variety is most likely to suit his conditions, a farmer should obtain seed and raise his crop. This is by no means the end of his trouble however. The future crop has to be considered; and to maintain the quality of his new variety careful selection of the seed must be made. Unless care is exercised retrogression soon takes place; whereas strict attention to the point results in wonderful improvement. In the United States of America the improvement of maize by selection and breeding has been brought to a fine art and most remarkable results have been obtained. Many varieties have been raised, each possessing its own characteristics, but all agreeing in their wonderful purity. A thousand cobs raised from pure American seed will all be even in character, while amongst the same number raised from most of the seed in this State scores of differing sorts may be obtained.

The chief difficulty seems to be that maize-growers have not realised what are the important points to be looked for in seed corn. Generally if the cob is large and the grain looks big and possesses the particular bright yellow colour favoured by buyers, it is considered to be first class for seed purposes, and yet how often has the superficial appearance led the growers in quite the wrong direction! For instance, along the Coast the most popular variety is one known as Golden King or Hawkesbury Champion. It possesses these characters to a nicety and is in itself an illustration of the effectiveness of selection.

Unfortunately the selection has been exercised in the wrong direction. Mr. R. N. Makin, Instructor in Agriculture for the South Coast, points out that in some examinations made by him Hawkesbury Champion gave $35\frac{5}{7}$ per cent. of core as compared with $16\frac{3}{4}$ per cent. in Early Leaming, an improved variety. Even when the cob is very large, such percentage of core means that only a comparatively small amount of grain is obtained.

It will pay growers handsomely to use only carefully selected seed from pure varieties. Such seed may either be raised by growers themselves, or obtained by purchase from those who specialise in seed production. For the guidance of those who wish to improve their seed by selection, the following information is given. Corn breeding is a different matter and is not being dealt with at the present.

Mode of Selection.

All cobs intended for seed should be selected in the field. It is an axiom in breeding that like produces like. This however, only applies when normal conditions prevail. A cob, produced by a plant that has grown under specially favourable conditions, may be of remarkably large size and well proportioned and yet its progeny be no better than from ordinary ears. The selection of the cobs must therefore be made under such conditions that

the selector is able to form a reasonably accurate opinion as to whether they have been produced under normal circumstances. If the selection is left until the cobs are heaped in the barn, this cannot be done.

When the ears are ripe, the grower should go through the field with a basket and carefully select his cobs. It is advisable to leave those which have grown under exceptionally good conditions, as for instance where water has run in and irrigated the crop, as they are likely to be of weak constitution. In making the initial selection several points must be kept in mind. It is desired to obtain a prolific strain; it is therefore better to select ears from stalks which bear two good medium-sized ears rather than from those which have one ear only. Cobs should only be taken from stalks which stand up firmly; weak-stemmed plants are likely to be blown down by wind. The ears should not be borne too high nor too low on the stalks, and the stem of the ear should be of medium length and not too coarse, while on the other hand where the stem shows a tendency to weakness, the cob should be discarded. The husk covering the cob should neither be too scanty nor too plentiful and coarse. A medium condition is the desirable one. Sometimes the husk is so scanty that it fails to cover the tip of the cob and much of the ear is destroyed by weather, insects, etc. On the other hand a cob covered by great, coarse husks is rarely a good one.

Having made the initial selection in the field, the cobs should be taken to the barn and closely examined. As during the final selection many cobs are discarded, more should be gathered than are required. About 75 lb. of cobs produce a bushel of shelled grain.

The following score-card for the judging of maize at Shows has been evolved by Mr. R. N. Makin, and its careful study is recommended to those who desire to improve their seed by selection.

SCORE-CARD FOR MAIZE.

Association..... .... Date..... .....

Judge..... ....

	Standard.	Score. Nos. of Exhibits.							
		1	2	3	4	5	6	7	8
1. Shape of cob	5								
2. Colour of grain and core ...	15								
3. Uniformity	10								
4. Filling up of tip	5								
5. Filling up of butt	5								
6. Length and circumference of cob	15								
7. Condition of seed	5								
8. Shape and uniformity of kernel	10								
9. Space between rows	10								
10. Proportion of grain to core ...	20								
Total	100								

Explanation.

1. Shape of cob to be in accordance with the characteristics of the variety; the most desirable shape being cylindrical, i.e., of equal circumference from tip to base.
2. The colour should be whole and free from any discoloured grain. Yellow or red grain should have a red or pink core; white grain a white core.
3. General appearance and trueness to type. Lack of uniformity should be considered a serious defect.
4. Tips full of grain and well rounded.
5. Butt well rounded off to shank and well filled; no spaces.
6. According to variety standard. Average circumference about seven inches. Circumference to be measured one-third of the way up from butt.
7. Ripeness, soundness, and freedom from insect and fungus troubles.
8. Shape of kernels varies according to variety. The wedge shape is the ideal. Thin, shrunken, sharp pointed and rounded kernels are objectionable. The germ in the grain should be large and running well up to the tip.
9. A large space is undesirable. It is noticed chiefly in broad, short-grained varieties, and is a serious defect.
10. A good cob should contain 85 per cent. of grain to core. This is a very important point.

Varieties.

In making his choice of varieties, the grower should take into consideration the special conditions under which he is growing his crop. A farmer on the Tablelands or in the inland districts would meet only with disappointment if he selected one of the long-season, heavy-yielding varieties from the North Coast, while the latter would probably not find a variety from the former districts suitable.

The different varieties vary considerably in the length of their growing season. Some only reach maturity after 7 or even 8 months, whilst others ripen their grain in from 3 to 4 months. Speaking broadly, the longer the life of the plant, the higher its yielding capacity. At the same time, of course, varieties having equal periods of life differ considerably in their yields. If we take any of the early-maturing varieties and place them alongside the late varieties on the North Coast, we shall find that the latter, on the average, will outyield them considerably. Climatic conditions on the Coast favour the late varieties. The summer season is long, a good regular rainfall is generally experienced, and the atmosphere is usually fairly humid. In the interior different conditions prevail. On the Tablelands the summer is short, and the late-maturing varieties are generally frosted before they reach maturity. Further inland, as at Inverell, hot, dry conditions prevail, so that although the summer is long, it has been found inadvisable to sow late varieties. Except under abnormal conditions, as when a very wet summer is experienced, it is the early varieties which give the best returns.

Thus we may say that the grower on the Coast, which has a long summer and fairly regular rainfall, would select the late varieties; the Tableland grower is restricted to quick-maturing sorts on account of his short summer, while the inland grower will find the fairly early kinds the most suitable on account of his dry atmosphere and scarcity of rain.

Improved Yellow Dent.—Is a late variety which has given very satisfactory results on the North Coast. A considerable amount of attention has been bestowed upon it by the Manager of the Grafton Experiment Farm

who has succeeded in evolving a strain of high quality and uniformity. It is a hardy variety and stands without injury a lot of rain when ripe. The husk surrounds and covers the grain completely, thus preventing the ingress of water. It grows to a good height, and is valuable for fodder or silage purposes. The ears are of medium size, generally 9 to 10 inches long, and about 8 inches in circumference. They are solid and heavy. The grain is arranged in rows of eighteen or twenty on the cob. The kernels are fairly large and somewhat of the horse-tooth character. The grain is hard with a fairly smooth indentation. The body of the grain is of a bright golden colour while the crown is light yellow.

It is recommended for the Coastal districts; being a late variety it is not suitable for the Tablelands or the interior.

Funk's Yellow Dent.—This variety was imported a few years ago from America by the Department of Agriculture. It has been a consistently good yielder in the localities for which its period of maturity fits it, and is rapidly becoming a favourite. It is fairly early, and is thus suitable for the Tablelands and drier districts. It also gives good results on the South Coast, but has not excelled on the North Coast. There it is usually beaten by later varieties. The stalks are of medium height and somewhat slender. The ears are nine to ten inches long and about seven inches in circumference. The variety is specially noted on account of the very large number of rows on the cob. Individual ears have carried as high as 32 rows. The rows of grain are extremely closely packed, and there is not the slightest space between the crowns. Although the core is somewhat large, this close packing gives a high percentage of grain per cob. The grain in the cob appears light in colour, but where sheltered it is a good bright yellow.

Early Leaming.—This is a medium early variety. It has done exceptionally well in the coastal areas, and has also given good yields at Inverell. It is perhaps a little too late for tableland districts. The ears are tapering, with the grain very tightly packed upon them. They are somewhat short, averaging about eight or nine inches, and seven inches in circumference. The grain is deep, light red in colour and heavy. The variety always gives a good percentage of grain to the ear. The cob is well protected by the husk, and it has been found at the Grafton Experiment Farm to stand a lot of wet weather. It produces a medium stalk, and is valuable for fodder purposes.

Early Yellow Dent.—This is a very early variety, and can be strongly recommended as a grain crop for the Tablelands and the hot, dry districts. It is very hardy, and gives a big yield of grain. The stalks are short, and it does not carry a great amount of foliage. The cobs are medium size and generally well filled. The grain is a good bright yellow, fairly heavy, but not very deep, and slightly rounded.

Hickory King.—A fairly early white variety. It has been found more suitable for fodder purposes than grain production, as it generally gives a comparatively light yield of the latter. The stalks grow to a fair height and carry a large amount of leaf. The stems are soft and palatable, and it

is on this account that it is popular as a fodder crop. The ears are somewhat short. The grain is ivory white, large, broad, and rounded. The core is very small.

Boone County White.—A variety imported from the United States of America a few years ago. It has been brought to a high degree of excellence there, and often wins the championship at corn shows. It is a fairly early variety. The ear is large both in length and circumference, and is very nearly perfect. The rows are uniformly straight, the grain is even in character, and the butts and tips of the ear well filled. It is an excellent illustration of the improvement that can be brought about by systematic breeding and selection. The colour of the grain is creamy white, and the indentation fairly rough. It has the disadvantage that the husks do not completely protect the tips of the ear, and consequently some of the grain is liable to injury from insect and fungous pests, and from weathering.

Red Hogan.—A late variety that is deservedly popular on the Hawkesbury. Unfortunately pure seed is seldom seen, as it is generally crossed with other varieties growing in the vicinity. The ears are large and well filled. The grain is deep, wedge-shaped, dark yellow or red in colour and heavy. The indentation is smooth. The percentage of grain to ear is good. The stalk grows to a great size, but is somewhat coarse, except when grown on the lighter soils.

Hawkesbury Champion (known sometimes as *Golden King*).—This is an old late variety which is rapidly reaching the oblivion it deserves. The cobs are very large, and this makes it deceptive, as the percentage of core to grain on the ear is very large. A low yield is often obtained where, judging from the appearance of the cobs, a large one was expected. The grain is bright yellow, large, round, and flat. The indentation is smooth, and extends right across the grain. Owing to the rounded shape of the grain, a large amount of space exists between the rows. The stalk grows to a great height, and is somewhat coarse.

Fungus on Passion Vine.

A specimen of diseased passion-fruit was recently forwarded for examination by Mr. G. J. Hunt, of Mangrove Mountain, *via* Gosford. The report from the Bureau of Microbiology stated:—The disease is due to a fungus—*Gloeosporium*—which produces "Ripe Rot" in many fruits. It is here also producing pustules on the vines. It usually attacks plants at the time when the fruit is commencing to ripen, so that treatment, or really prevention, should be commenced when the fruit is appearing. Ventilation of the vines will be very helpful; allow plenty of sunlight and air to the plant, especially round the bases of the stems. Water or moisture lying on the leaves, &c., helps to propagate the fungus. Powdered lime and sulphur, or lime and sulphur spray, is probably the most suitable preventive.

Notes on some Grasses from Condobolin.

E. Breakwell, Economic Botanist.

The Condobolin district is well provided for in the way of native grasses, judging by the samples recently received from the manager of the Condobolin Government Demonstration Farm.

Noticeable features about the grasses are that most of them were well above the average size, and that they were remarkably vigorous considering the lateness of the season (May).

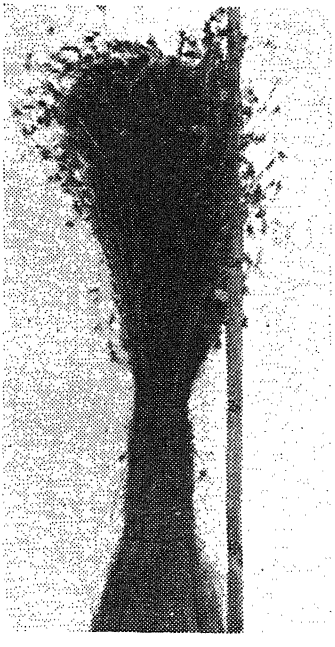


Fig. 1.—*Anthistiria ciliata* (**Kangaroo Grass**).
Height, 5 feet; well above the average.

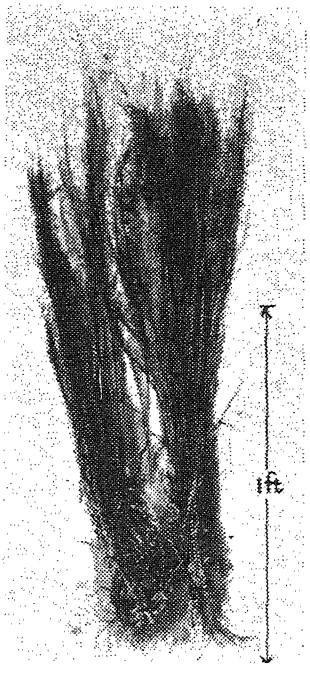


Fig. 2.—*Panicum effusum.*
Height, 2 feet; a very tall sample.

The photographs are mainly intended to show the heights of the grasses. The botanical descriptions, etc., may be ascertained by referring to previous issues.

Fig. 1.—*Anthistiria ciliata,* Linn. (Kangaroo grass). Figured and described in *Agricultural Gazette,* Vol. I, p. 309.

Very widely distributed in New South Wales, but it is now only generally found in enclosed or in judiciously-stocked areas. Mr. McDougall, the manager of the farm, forwards the following note with the sample:—"Grown on Palesthan Station (western lease), 40 miles West of Condobolin, and 5 miles north of the proposed line from Condobolin to Broken Hill. Mr. Hatch, the manager of the station, informs me that there are thousands of acres on Palesthan growing grass like this sample, and a lot much better and taller."

The virtues of this grass are so well known that they require no repetition.



Fig. 3.—*Eragrostis lacunaria* **(Never-Fail Grass).** Height, 2 feet; an exceptionally tall sample.

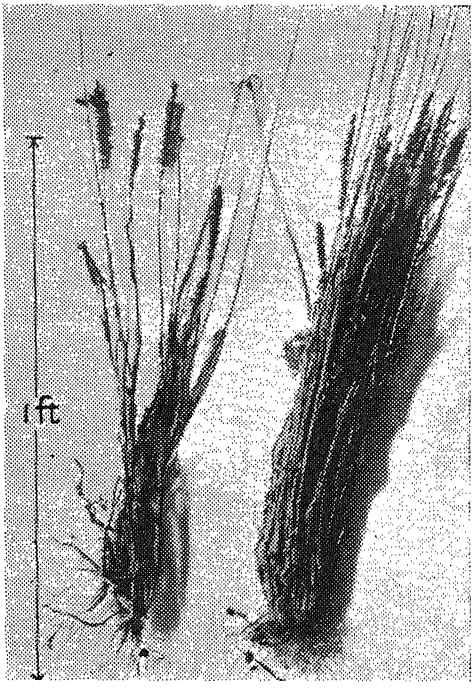


Fig. 4.—*Lappago racemosa* **(Smaller Burr Grass).** Height, 1 foot 3 inches; well above the average.

Fig. 2.—*Panicum effusum,* R.Br., *vide Agricultural Gazette,* Vol. III, p. 389. New South Wales is rich in the supply of Panic grasses. *P. effusum* grows on all classes of soils right throughout the State, and on good soils provides plenty of palatable flag.

Fig. 3.—*Eragrostis lacunaria,* F.v.M. (Never-Fail grass). *Vide Agricultural Gazette,* Vol. IV, p. 523. The sample received was a particularly fine

one. Its usual height is 1 foot, but the specimen was nearly 2 feet. Although a little "woody" in the stem this grass is readily eaten by stock, and is a good, dry-country grass.

Fig. 4.—*Lappago racemosa*, Wild. (Smaller Burr grass). *Vide Agricultural Gazette*, Vol. VII, p. 129.

This grass will grow well on cultivated land. It remains green, practically all the year round, and, although small, provides a fair amount of nutritious feed.

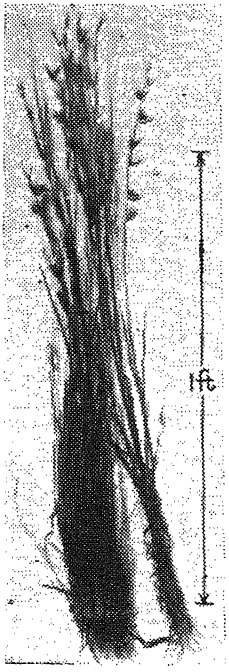


Fig. 5.—*Danthonia bipartita.*
Height, 1 ft. 3 in.; average sample.

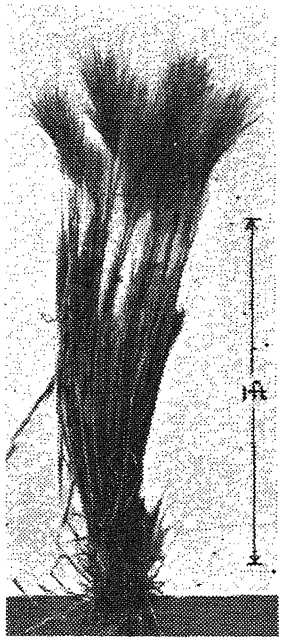


Fig. 6.—*Aristida Behriana* (A Three-awned Spear Grass).
Height, 1 ft. 6 in.; above the average.

Fig. 5.—*Danthonia bipartita*, F.v.M. *Vide Agricultural Gazette*, Vol. II, p. 23. A grass belonging to the same family as the famous Wallaby grass. It is particularly adapted to arid districts.

Fig. 6.—*Aristida Behriana*, F.v.M. (A three-awned Spear grass.) *Vide Agricultural Gazette*, Vol. II, p. 201.

A very common grass in the interior, and provides good feed in the early stages. Its bushy inflorescence and spear-like seeds are against it when mature.

Fig. 7.—*Neurachne Mitchelliana, Nees* (Mulga grass). *Vide Agricultural Gazette*, Vol. II, p. 28.

Another grass well adapted for dry areas. It is perhaps not quite as common as many of the other native grasses, and, for this reason, should be highly valued.

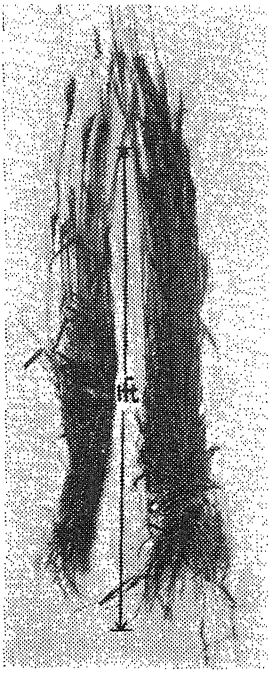


Fig. 7.—*Neurachne Mitchelliana* (Mulga Grass).
Height, 1 ft. 3 in.; an average sample.

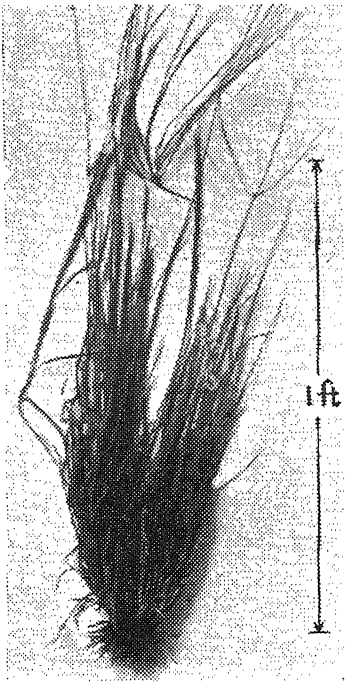


Fig. 8.—*Chloris acicularis* (Lesser Star Grass).
Height, 1 ft. 3 in.; an average sample.

Fig. 8.—*Chloris acicularis,* Lindl. (Star grass). *Vide Agricultural Gazette,* Vol. III, p. 147. The two most abundant star grasses in the interior are *Chloris truncata* and *Chloris acicularis.* Both are good sheep grasses. The former, however, has one disadvantage, viz., its inflorescence is often very large, and its flag extremely small. *Chloris acicularis,* however, has a large amount of flag, commences to grow in the early spring and lasts through the summer well into the autumn.

Fig. 9.—*Panicum gracile,* R.Br. (Slender Panic grass). *Vide Agricultural Gazette,* Vol. III, p. 317. This may be considered one of the best grasses for red soils under adverse conditions. It will be one of the last to wither in a dry period, and it is readily eaten by stock.

Fig. 10.—*Panicum leucophœum,* H.B.K. (Cotton Panic grass). Another good Panic grass. Very few Panic grasses will be found on overstocked areas, but under judicious treatment they will readily spread, and will provide a great bulk of fodder in summer and autumn.



Fig. 9.—*Panicum gracile*
(Slender Panic Grass).
Height, 1 ft. 3 in. ; an average sample.

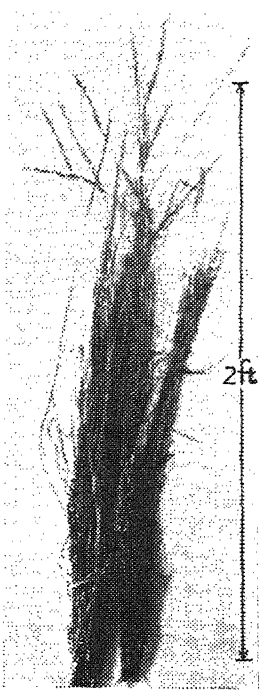


Fig. 10.—*Panicum leucophœum*
(Cotton Panic Grass).
Height, 2 ft. 3 in. ; well above the average.

Lime-burning.

Mr. A. J. Wilson, of Griffiths' Flat, Lambton, Newcastle, writes :—

I noticed an article on lime-burning in your April number. This is a common way of burning lime on the Murray in South Australia, and they turn out not only agricultural lime but the best of building lime :—A 12 to 14 feet cube is excavated, with a trench 2 feet wide, slanting to the bottom for lighting purposes. Pieces of thick wood are laid at intervals of about 3 feet, and in between are put dry boughs, &c., for lighting. The fire can then spread all over almost immediately, and thus the lime will be evenly burnt. The first layer of wood is put crossways on the bottom pieces, and then alternate layers of stone and wood not more than 18 inches thick, finishing with a layer of wood. This ensures the top stone being burnt. The quality of the lime depends on the limestone, and also on the wood. The harder the limestone the better the lime ; but it is necessary to have good solid wood for hard stone, just the sort of wood that burns the best charcoal. Soft limestone only burns poor powdery lime and needs only soft wood.

Some Diseases of the Horse's Foot.

A. E. MASSY, M.R.C.V.S., Government Veterinary Surgeon.

Corn.

THIS is a bruise of the sensitive foot under the horn of the sole, and the seat is in the triangular space between the bars and the wall at the heel. It occurs in the fore feet, and generally on the inside. The earliest sign is a red staining of the horn, which later becomes purple, then yellow.

Cause.—Certain types of bad conformation predispose to it, viz., wide open feet with low heels, and those with flat soles, but the direct cause is the pressure of the heel of the shoe. A short shoe fitted too closely; a shoe worn too long, when as the hoof grows the shoe is carried forward and heel presses on the seat of the corn; a too free use of the knife, lowering the inside heel too much; and excessive paring, thus weakening the sole, may all cause a corn.

Symptoms.—Often shortness of the step; when at rest he shifts weight from one foot to another, but lameness is not characteristic.

If neglected, suppuration may supervene, with intense lameness, and pus may work its way upwards and burst at the coronet, causing what is known as a "quittor."

Treatment.—The direct cause must be removed, and in most cases the shoeing requires attention, and a $\frac{3}{4}$ shoe, plain or bar, will be found useful, and its use should be continued until the corn has worn out. In a dry corn nothing else is required.

Paring out corns is to be avoided at all times, as the sole is weakened and no good results follow this practice. If pus is present, the horny sole over the affected area must be removed, and its evacuation aided by antiseptic poultices, such as a bran poultice, a little lysol being added to the water with which it is made. This should be continued for a couple of days, after which the wound should be packed once daily with the following dressing: Iodoform 1 part, boracic acid 6 parts—or with a saturated solution of iodoform and eucalyptus oil—then covered with a piece of tow and bandaged, and treatment continued till healing occurs.

In a neglected case which has eventuated in the formation of a quittor, the services of a qualified veterinary surgeon should if possible be at once procured.

Thrush.

This is indicated by a fœtid discharge from the frog. It is first noticed in the cleft of that organ, and if neglected may spread, with the result that the whole frog may slough out.

It is common in badly-kept stables, where the animals stand in decomposing fæces and urine, with the result that the hind feet become affected.

Horses grazing on damp pastures, or kept in wet and dirty sheds, also suffer.

Treatment.—All loose horn should be pared away if the discharge is profuse. Poulticing the feet for a day or so is advisable, after which the application of the following powder once daily will generally effect a cure :—

Calomel, 1 oz.
Calamine, 3 oz.

The powder should be worked down into the cleft of the frog, and then some tow well wedged in on top of it to prevent it coming out.

The above treatment can be much supplemented by using shoes low at the heels, and so allowing frog pressure.

Laminitis, or Fever in the Feet.

An inflammation of all the vascular structures of the foot. It most commonly affects both fore feet, rarely both hind, though one foot alone or all four may be involved.

Some animals are predisposed to it as the result of defective conformation, e.g., horses with flat, badly-formed feet, and those with weak heels. Grossly fat horses are liable, as excessive weight has to be borne, and once an animal has had one attack he is liable to another.

Of the most direct exciting causes are errors in diet, large feeds of new grains—wheat, oats, etc., long journeys on bad roads, causing over-exertion ; errors in fitting the first pair of shoes, especially if preceded by excessive paring. It occasionally occurs after severe attacks of influenza and colic, and after the administration of too severe doses of purgative medicine, and sometimes is seen as a sequel to a difficult foaling.

Symptoms.—Shivering fits, rapid breathing, blowing, stiffening of the loins, temperature up to 105 degrees or even 106 degrees Fahr., mouth dry, lining membranes of eyelids and nostrils injected, urine passed in small quantities and high-coloured, and fæces pellety and covered with mucus ; hoofs and coronets very hot. The animal stands in a peculiar and characteristic attitude. When fore feet are affected they are advanced, resting the heels, and the hind brought forward underneath the body ; when the hind feet are affected, the fore and hind are brought together underneath the body, and there is a great inclination to lie down ; once down he lies with legs stretched out, moving them in a weary fashion, and is not inclined to rise.

If all four feet are affected, the animal stands with them spread out in front and behind.

Treatment depends on the cause. In all cases, however, the shoes should if possible be removed at once, and bran poultices, either hot or cold, applied, and the animal kept as warm as possible. When due to errors in feeding, the animal should be given a good dose of laxative medicine, from 1 to 2 pints of linseed oil, according to size, and its action aided by enemas of soap and water.

If due to over riding or driving, diarrhœa is usually present, and no laxative medicine is required

The following drench may be given to relieve the pain and reduce fever :—

Spirits ether nit., ½ oz.
Liquor ammonia acetate, ½ oz.
Tincture belladonna, from ½ to 1½ oz., according to size.
Water, 1 pint.

and may be repeated in four hours if required.

The diet should consist of hay, bran mashes, and green food if procurable : no grains must be allowed during the attack. Once the acute inflammatory symptoms have subsided, the animal should be shod as soon as possible with shoes thickened at the heels and the length of the heels increased as much as possible. He should also be given gentle exercise.

Wounds of the Hoof.

The above may be regarded as indicating all injuries caused by an animal treading on foreign bodies, which thus penetrate the soft structures of the foot.

Such bodies include nails, wire, and pieces of iron or glass. The horny sole is sufficient protection, and such foreign bodies almost invariably enter through the frog, injuring the sensitive under structures of that organ, and in exceptional cases may injure the pedal or navicular bones.

Treatment.—The objects aimed at are to prevent infection, and to limit the spread of inflammation.

The foreign body must be located and removed, and precautions taken against any particles being left behind, after which the wound must be well washed out with some antiseptic solution. If a nail has caused the injury, the track should be cut out until the injured soft structures are exposed, after which the wound must be thoroughly washed out with some antiseptic, such as Jeyes' or lysol, and then packed with either of the dressings recommended for the treatment of suppurating corn, and then bandaged. The wound must be dressed and bandaged daily until healing occurs. When the animal is fit for work, the sole should be smeared with tar, packed with tow, and a leather sole put on with the first shoeing to prevent any future injury to the old wound, which will then be only covered with a thin layer of horn.

Effect on Cattle of Ergot in Rye.

In certain parts of England abortion in cows has been attributed to the cattle eating rye which is attacked by ergot, and though a few cases may have been due to it when frequent in the later summer months, through cattle eating very badly-affected rye, the majority of cases have now been proved to be caused by the entrance of micro-organisms into the uterus, chiefly the one known as Bang's bacillus.—S. T. D. Symons.

The Vine in Australia.

[Continued from page 339.]

M. BLUNNO, Viticultural Expert.

PRUNING.

THE age which a vineyard may attain depends not only on the fertility of the soil, whether natural or artificially kept up, or on the careful cultivation it receives, but also, and to a great extent, on the skill and care of details in pruning. I have seen in this State vineyards that at twenty years were practically worn out, while one in the Albury district at fifty-one years and another near Inverell at sixty-three years still bear profitable crops. The former was trained after the gooseberry-bush fashion, the other on the permanent cordon system. In either case the old branches and cordons were periodically lopped off and new arms formed.

A large area in this State is suitable for vine growing, inasmuch as a minimum average of 12 inches of rain per year is sufficient, provided the soil is well and deeply broken up before planting and kept well tilled afterwards. Where the rainfall is near this minimum, however, vines should not be trained too high from the ground, a stem of from 12 inches to 20 inches being sufficient. All the vineyards of the dry areas in the South of Europe are trained on the gooseberry-bush fashion, with slight modifications particular to some districts, but all the vines have a short stem In some places the typical Guyot's system was successfully introduced, and again a vine so trained is not too high from the ground. In the Corowa and Albury districts, with an annual rainfall of 21 inches and 28 inches respectively, we find the gooseberry-bush method of pruning generally adopted, but several vineyards on the Guyot system give very satisfactory results. In the Albury district the rainfall would be sufficient for the adoption of permanent cordons, if it were not that the summer precipitations are usually rather scarce. Permanent horizontal cordons are adopted in the Hunter River Valley, where the rainfall is from 30 inches (Singleton) to 34 inches (West Maitland), also in the Inverell and Canoblas districts, with a rainfall of 31 inches and 37 inches respectively, and sufficient summer precipitations.

Permanent cordons are not really permanent, because from time to time they are cut off and renewed with a new one-year-old cane. The spurs that the cordon carries are also the subject of attention; they should never be allowed to grow too high over the cordon. In order to obtain this, the vigneron should always cut back as a new spur the lower of the two canes

grown on the old spur, as shown in Fig. 1. When after a number of years a knotty knob forms at the base of each spur, it is advisable to remove the growth A and make a spur out of cane B (Fig. 2).

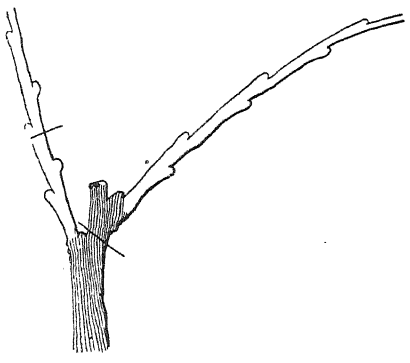


Fig. 1.

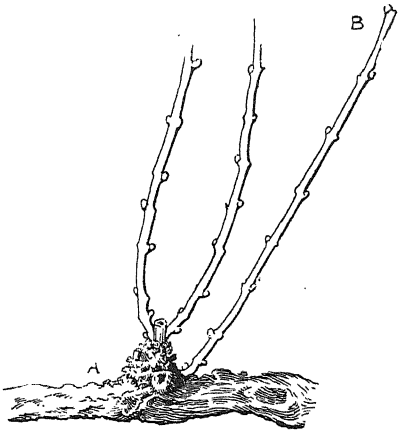


Fig. 2.

Fig. 3 shows how to renew an old cordon. Suckers sprout frequently from the old wood, so one is allowed to grow if suitably located, and in the pruning the sucker is cut hard back to one eye. From this will come a vigorous cane *a*, and in the succeeding pruning the old cordon is sawn off in *b*, and the cane *a* stretched along the wire as in Fig. 4.

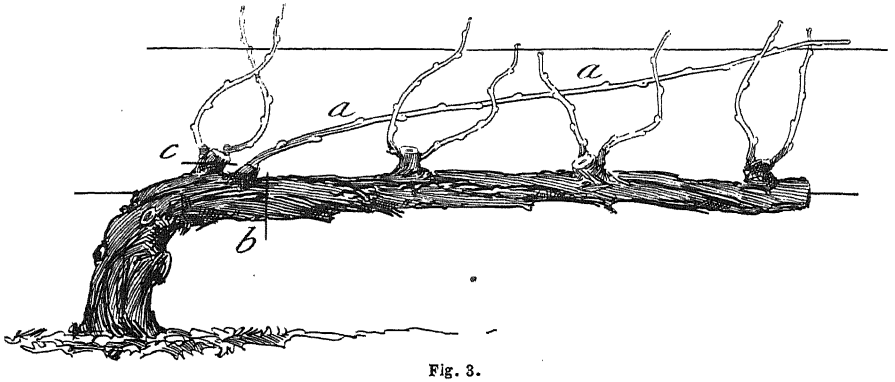


Fig. 3.

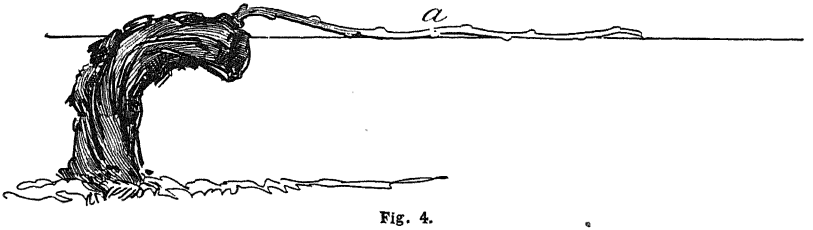


Fig. 4.

Fig. 5 shows another instance in which the cane *a* comes from a one-eyed spur grown on the knob of an old spur. This is the best way of re-forming a cordon, which is then trained as in Fig. 6. It is preferable because the cane may be more easily laid on the wire and it also avoids the protuberances on the cordon in Fig. 4.

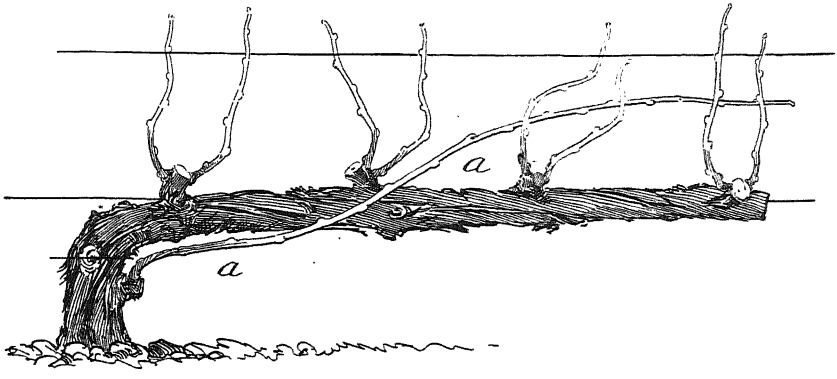


Fig. 5.

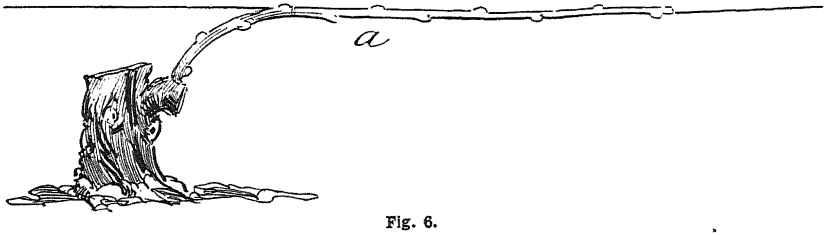


Fig. 6.

Relation between Rainfall and System of Pruning.

In districts with a relatively poor rainfall, the branches of a vine after a few years lose their suppleness. They become rigid, as the sap does not circulate so freely in the older wood as it does in the one-year rods. This great inconvenience is more felt the greater the height of the stem and the length of branches or cordons. Near Wodonga (Victoria), just across the Murray at Albury, I saw the remains of a vineyard which the proprietor intended to train *en chaîntres*. This method was first advocated by the same great French Viticulturist whom we have already mentioned, viz., M. Guyot, but never became popular. I do not think it necessary to describe it; it may suffice to compare it to a trellis, such as is usually seen on verandahs or in pergolas; only, instead of the trunk and branches being vertical and high from the ground, the stem is short, and the main cordon, as well as its branches, run very close to the ground. The necessary supports of the branches are a number of short, forked sticks instead of being a lattice frame or several wires or some other similiar device as are seen in the trellises sheltering verandahs or in the frame work of a pergola. Each of these vines *en chaîntres* is allowed a large space for its

development, and a detail of the system is that when ploughing is to be done the branches of each vine in the row are lifted and temporarily laid aside in order to allow the plough or other implement a clear space in the row. In such districts of France where it was tried, the vine stem had enough suppleness to be so handled even when several years old, but at Wodonga after a few years the stem became so stiff and rigid that it was impossible to shift it an inch; so eventually the vineyard was abandoned. The point to be noted is that in rich, loose, deep soil, and where the rainfall is sufficient and well distributed throughout the year, or where water is struck close to the surface, vines may be relied to keep for a number of years a certain suppleness and pliability on account of the elasticity of the fibro-vascular tissues.

The mineral ingredients available as a plant food are held in solution in the soil; obviously such solution is more concentrated in the soil of a country where temperatures are higher on account of the strong evaporation, and thinner where the climate is cooler, or where rains are frequent and sufficient, or where underground water runs closer to the surface. Transpiration includes evaporation by the foliage of the watery part of the sap, and this is the more rapid and intense the higher the temperature; with an active and intense transpiration there is a corresponding rapid and continuous absorption by the roots of the soil water, which is required to make up for that lost by the foliage through evaporation. This water carries the mineral plant food ingredients, and constitutes what is commonly called sap, but in a dry climate it is, as already stated, very concentrated. The tissues of the stem and branches thus get more quickly incrustated than is the case in climates where the transpiration is less intense, or where on account of the larger storage of moisture in the soil the sap is thinner. The incrustations make the tissues rigid and the vine loses its suppleness, and the channels for the circulation of the sap get gradually obstructed; thus in time not only do we have rods and spurs which fail to shoot from all their buds, but a whole branch may die, or at any rate remain dormant without any apparent cause. Vines under these conditions get prematurely old, and we may, by analogy with a well known fatal human malady, call this premature ageing arteriosclerosis of the vine. The secret for keeping up the cropping capacity of vines in hot and dry climates is to always lop off the old branches with too many knots and twists and form fresh ones in their place. It is also wise to keep the soil always well disturbed in order to husband the moisture stored in it. Another important rule is never to train the vine too high from the ground in a hot climate with scarce rainfall, unless the soil is well supplied with natural moisture. The vineyards in the southern districts of Europe are formed with vines not only having very short stems, but also usually pruned on the spur system, or at most, one or two rods are left when trained on the Guyot method. But in the south of Europe we also find vineyards with very long stems, very high from the ground and trained with long cordons. These vineyards are found on the Flegreyan fields round Naples, not only because there the

rainfall is not scarce, but principally because water is struck at a very shallow depth; similarly trained vines may be found away from the coast among the hills where rainfall is between 35 and 40 inches or more, and elsewhere in Samnium, Abruzo, Tuscany, &c. On the contrary, on the Apulian plains, stretching along the southern Adriatic, the *Siticulosa Apulia* of Horace, where the rainfall is from 18 to 20 inches, the vines have a very short stem, with a couple of branches carrying only three or four spurs, in spite of the fact that the ground there is hand-trenched down to 2 feet or more, thus enabling the soil to store all the rainwater. It is easy to understand why, where summers are hot and dry, vines should be trained with a short stem. The soil water rises from the ground into the tissues of the plant principally by capillary action. Evaporation by the leaves of the vegetation helps capillary action, the foliage acting as a pump to lift the soil water to keep up the supply required by the tissues. If the vine-stem be high off the ground, the capillary tube will consequently be of the same length. The length of this is one of the factors regulating capillary action; all other conditions being equal, as the length of the tube increases the rapidity with which a liquid rises becomes less, till it will rise no further. The second factor is the quantity of water available—in our case the amount of moisture in the soil. The more of this is available the higher the water will rise. The third factor is the diameter of the capillary vessel; the smaller this is, the higher the water will rise. The diameter of each element of the vascular system of the plant is so infinitesimally small as to allow the moisture of the soil to rise to a greater height than that of any vine grown. This would be so if the vascular tissues could be kept always clear, but the continuous incrustation going on, the twists, scars, bends, and knots, consequent on pruning, offer a certain resistance to the free rising of the sap, and where the flow is checked the sap drops more of the mineral ingredients it carries, and after a while the channels there are finally choked.

In the case of short-stemmed vines, the sap rises to the tip of all branches with full force, the number of knots and bends is smaller, and the number of obstructions therefore fewer.

I saw a vineyard in the Murrumbidgee district trained with very long rods, and with a stem about 4 feet high. The vines bore magnificent crops for the first six or seven years, then the vigour began to relax and some of the vines to die back.

How to make the cuts.

In pruning it is at present customary to cut off a cane, or saw off an arm very close to the wood from which such cutting or arm branches off. No doubt when cuts are thus made the vine has after pruning a neater appearance. The system, however, is to be deprecated for this reason. It is obvious that every such cut, when made on live tissue, causes a wound. The live tissues thus exposed dry up and die, but this drying up and dying is not limited to the surface layers; on the contrary it works down into the wood—in fact, the dead tissues form somewhat of a wedge into the live ones and thus obstruct them. Considering the number of cuts made every year on a

vine, it is easy to understand how many such obstructions are thus caused, which are bound to interfere with the free circulation of the sap. Often one sees an arm of a vine not starting at spring, while the others bud forth as usual, and the grower wonders what is the matter. An examination of such arm in the majority of cases shows live tissues, with at intervals patches of dead ones; the circulation in such case is obviously impaired, and sometimes it occurs that an arm starts off in spring as if nothing were the matter, but in summer the shoots die off, more or less suddenly. In several instances this can be put down to the gradual working of dead patches deeper and deeper until they shut off the sap, as in *a*, Fig. 7. The proper way to cut or saw off an arm is to always leave a little stump of an inch (*b*, Fig. 7), and when this has dried up, the bit of dead stump can be removed close to its branching off in order to give the plant a trim look.

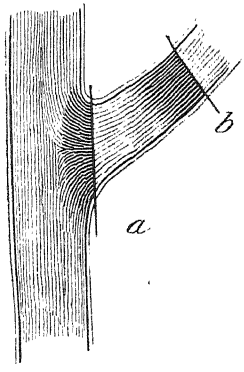


Fig. 7.

Disinfection of instruments in surgery saves thousands of lives, because operations are performed with all appliances previously sterilized, and in an environment as free as possible from all sources of contamination. Plants, although incomparably less sensitive to certain infections and endowed with greater recuperating power than animals, are nevertheless liable to a number of diseases caused by insect or fungous pests, microbes or plasmodia. When any cut is made which leaves a large surface of tissue exposed, such tissue is likely to become contaminated by some of the numberless germs found in the air and especially in the soil, with the consequence that a sort of dry rot starts at the surface and gradually works in. To prevent infection of these wounds from outside it is advisable to daub every large cut with thick lime wash or tar.

When pruning a cane down to the suitable length of a rod or a spur, many make the cut flush or very close to the eyes. The consequence is that, if the winter be dry, or if winds prevail, the bud suffers. The rational way of pruning is to cut through the eye next to the one which we wish to grow so as to leave a whole joint. The thickness corresponding

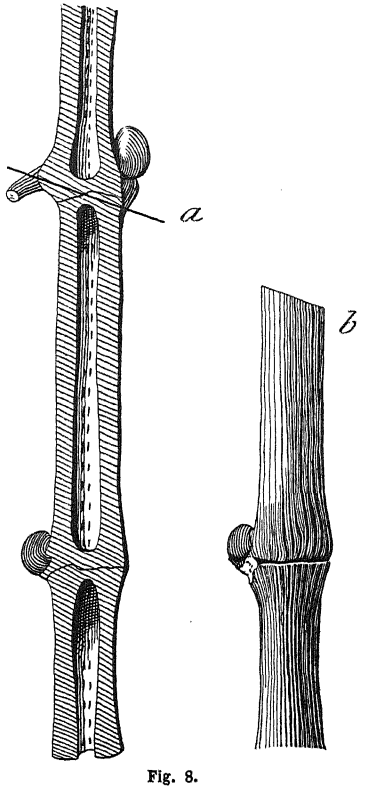


Fig. 8.

to every bud is transversed by a ligneous diaphragm which divides the pith of one joint from that of the next. Theoretically the cut should be through such diaphragm (*a*, Fig. 8), but in practice it is sufficient that two-thirds of the joint be left over the bud, which in this way will be sufficiently protected; the cut also should be made aslant, with the slant in direction opposite the bud (*b*, Fig. 8). Before proceeding with the pruning the ties holding the arms of the vine to the wire should be cut and the plant left loose, so as to be more convenient to the pruner's hand. The pruning finished, tie up as follows:—These cordons, being more than one year old, have already acquired a shape, and nothing more is needed to be done to them; but in the case of rods, by which we understand the one-year-old canes, it is essential to give them a suitable bend at the proper point. In the Guyot system a bend is made near the bottom wire, so as to have as much as possible of its length laid on and tied to it; in the Cazenave-Marcon each fruiting rod is bent so as to form a sort of half circle, the free end being tied to the bottom wire. In the gooseberry-bush system, where the soil is rich and the vine is over-vigorous, a long cane is sometimes left in addition to the spurs, in order to harness the vegetative luxuriance and divert it into cropping faculty. Here again the rod is bent to make half a circle, and the free end tied to one of the arms of the vine (Fig. 9), or else is wound like a corkscrew round the vine stake (Fig. 10). This winding of a long rod is carried out in several European districts, and in general a long rod is never tied upright, but is always given a slant, an arching or one or more twists (Fig. 11), which are all devices to dispose the rod to yield more fruit. A vine cane is always very pliable when not too thick, and it is not difficult to bend or twist it without breaking if the operation is done carefully. It does not matter if the cane while handled creaks or cracks; this is not always the warning that the breaking point has been reached. Usually when the cane breaks it does so nearer the joint where it branches off from the old wood, because it is there that the cane is stiffer; therefore, before attempting to make a rather sharp bending, it is advisable to take the cane with both hands and give it a twist 6 or 7 inches from the old wood. The reason for arching or twisting a long rod is that the rushing up of the sap in the early spring along free channels causes the growth of too much foliage, to the detriment of the quantity of the fruit, but if we check such rush by the devices just described, we encourage the vine to bear more fruit and less foliage.

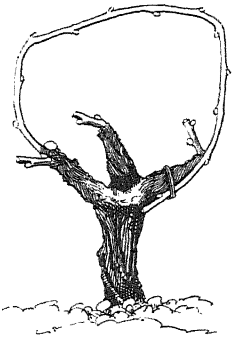


Fig. 9.

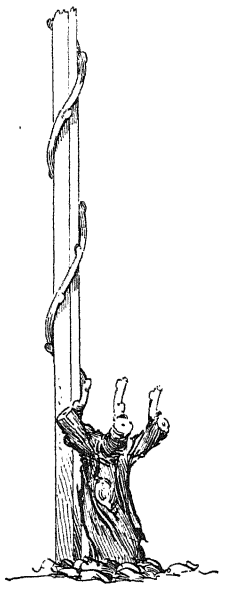


Fig. 10.

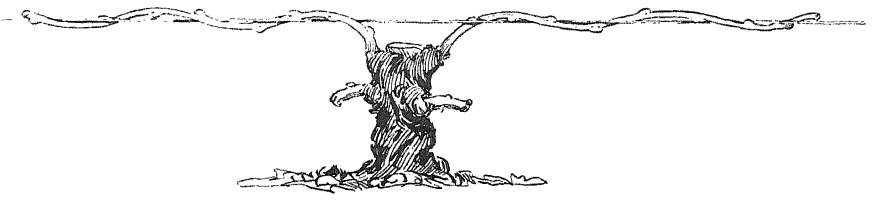


Fig. 11.

How to deal with Old and Neglected Vines.

When vines have been badly pruned or otherwise neglected year after year, the grower's principal business is to get the plants into shape. It will be found then that the pruning knife or the secateur will not be sufficient, and that the saw must be called into requisition. At other times similar work is required on old vines which, when trained after the gooseberry-bush fashion, may have grown too many arms, or else either too long, or in the wrong direction, or crossing and getting into the way of one another. Sometimes, if trained on the Guyot system, the stem, after a number of years, may have reached and grown over the bottom wire. In this case saw off at the point *a* and form the new branch with cane *b* (Fig. 12). Or, again, in the case of permanent cordons, the spurs in the middle portion of the cordons may be giving very weak if

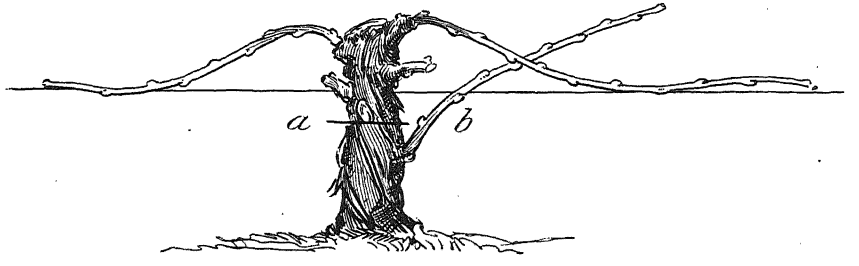


Fig. 12.

hardly any shoot (Fig. 13). Here, then, the old arms are cut at the points *a* and *b*, and the canes *c* and *d* are bent. It may happen that the circumcumstances enumerated above may occur together for the same vine, which may be old, and have one side of it deeply affected by dry rot, or by white ants, and also may have grown higher than permitted by the method of pruning followed. In such case the grower had better take a still more radical step. If there be a good cane growing anywhere on the stem, and the stem be sound below it, this is sawn off an inch over that cane, and the cane is pruned back to a two-eyes' spur, or longer, as the case may be (Fig. 14). From that spur or cane are started the new arms or branches. If no cane be available on the stem, a still more radical system is adopted, and the trunk is cut off an inch or so above the ground (Fig. 15). A number of suckers will spring either from

underground or from round the collar (Fig. 16); one or two of these are allowed to grow, and tied upright to a stake, the others being rubbed off. These two shoots in the following pruning season are treated as explained in the article published in the April issue. When either of these two

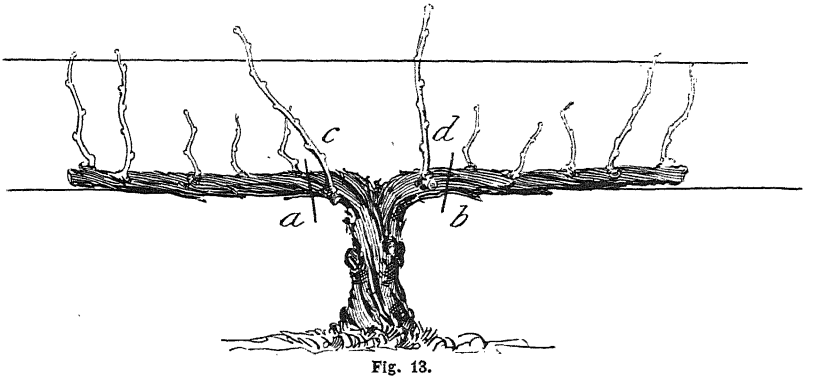


Fig. 13.

methods are adopted, particularly the latter one, a fresh lease of life is given to the vine, as practically we have a new plant. The temporary loss of crop can hardly be used as an argument against this, because this step is taken only in the case of vines enfeebled by age or neglect, which have consequently ceased to be productive. I have often advised growers to take this course, and every time success followed. A whole vineyard of some seventy-five acres, about twenty-four years old, pruned in a way after what was supposed to be the gooseberry-bush method, was treated in the manner just mentioned, and the system of pruning was changed into that of Guyot (simple or double) with the consequence that the crop was soon trebled and the vines, which are now forty years old, are still bearing very prolific crops.

It would be a very long task to describe the various systems of pruning in vogue in the various districts of other vine-growing countries. Practice and experience culled out the different methods attempted in every district, till one or two alone became general; that is why, although a vine can be pruned in manifold ways, we find thousands of vineyards in the same district trained after one fashion, which is, in the majority of cases, suited to the local conditions. Vine-growing is far older than exact sciences, therefore the principles on which pruning is based are not the work of abstract reasoning or of investigation in the domain of physics or plant physiology, but the result of several hundred years of practice and experience. Science in this case came later to crystallize in a few principles the laws governing the operation, and to explain why this system is suitable and that is not. All the various systems,



Fig. 14.

however, can be grouped under a few types, the principal of which have been here described. No reference has been made to the training of vines up living trees, which act as a support to the vine, because hardly any district in Australia is suitable, owing to the climatic and agricultural conditions.

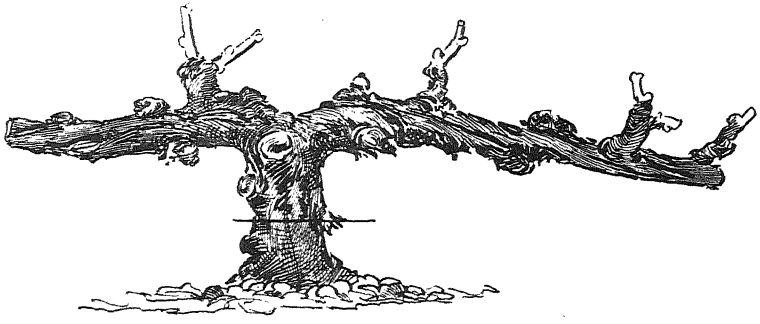


Fig. 15.

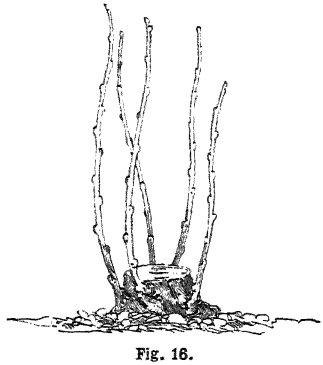


Fig. 16.

Rubbing off the old bark.

The last operation in connection with pruning is the removal of the old bark from the stem and oldest branches. The old bark shells off in strips, but rarely drops by itself, and year after year a new layer is added to the previous ones. Under this bark, or between its crevices, a number of insect pests lay their eggs, and it is therefore advisable to remove it. A mailed glove is sold by makers of viticultural appliances, with which the old bark can be rubbed off. I have not found it easy to work with, or very efficient either ; it is easier to pick the strips of the bark with thumb and first finger and pull it off.

It is desirable to lime-wash or otherwise treat the stems and branches of the vine after pruning, to destroy the spores of fungi and the eggs of insects. A good mixture with which to daub the stem and branches is that suggested as a preventive remedy against the black spot of the vine, viz., three quarters of a pint of commercial sulphuric acid and 5 lbs. of sulphate of iron dissolved in a gallon of water.

Design or "Lay-out" of a Commercial Apple Orchard.

R. GORDON EDGELL, Bradwardine, Bathurst.

Importance of Systematic Lay-out.

HAVING decided upon the class of fruit he intends to grow, and after obtaining his land, the orchardist is confronted with the problem of making the best use of it. The choice of design or "lay-out" is one of the most important factors in solving that problem. It cannot be too strongly insisted that this is by no means a matter for individual taste or fancy.

Upon it very largely depends the economical use of the land by the trees and the economical cultivation and working of the orchard. It is fundamental, and is the one factor which, once adopted, can never be altered. If we plant wrong varieties we can later on work them over to better kinds; if our methods of pruning or cultivation are faulty we may mend our ways afterwards; but once the trees are established in place we must, for good or ill, adhere to the system adopted. This may mean far more than the difference between profit and loss.

Much of what follows is applicable to all or many of the various systems of lay-out, and each grower should carefully consider the subject from his own point of view and conditions before he plants. It is proposed to describe in outline the methods adopted by the writer in the design of commercial apple orchards of 10 acres or larger area. The arrangement of the trees in various patterns throughout the orchards is almost as old as the hills, but as far as the writer is aware, some of the methods he describes are novel.

Analysis of the Principal Systems.

A commercial orchardist will aim at obtaining the highest average returns from the lowest average expenditure. Rather than produce a few specially fancy specimens he will desire to raise the all-round excellence of his crops. In order to do this, each root and branch of each tree should be encouraged to bring forth its best. Where one branch or twig is seen to crowd or interfere with its neighbour the pruner will unhesitatingly cut it back; but the same man will be found to so arrange his orchard trees that some of their roots are almost sure to crowd out some of the other roots, and because this takes place underground and out of sight, it does not trouble the orchardist's mind, though his pocket has to suffer.

As the young tree grows to maturity its roots will radiate in all directions, and the ground it feeds and lives upon will approximate to the figure of a circle, with the stem of the tree at its centre. It is not claimed that every root of every tree is equal, so that each occupies a perfect circle of the same size; but this is the average, especially where the orchard growth is healthy and where the trees are pruned and cultivated with a view to equality and symmetry. As the average tree will naturally occupy a circle of land, the planter should so arrange that each tree is provided with its circle of the requisite area, and that there shall be as little as possible of "waste" land in between the circles. The author does not claim that all the land between the circles is absolutely wasted; he realises that some fortunate root may push out into a "waste" corner, and so make full use of it; but the average root will not do this, and it is absurd for the planter to provide fantastic shapes of land for his trees to grow into just because by lucky chance some of them may be filled. In all examinations of systematic planting the natural requirements of the tree should be borne in mind, even though special conditions may be paramount.

Before deciding on the spacing of the trees, local and all other conditions should always be well studied, but these hardly fall within the scope of the present article. For the sake of illustration it will be advantageous to assume some definite width of spacing, and the distance of 24 feet (which is suitable for most Bathurst conditions) has been adopted in this article.

On the assumption that our estimate of the tree's natural growth is correct, each tree at maturity will utilise a circle of ground 24 feet in diameter. If we provide less, the roots of adjacent trees will crowd each other; if more, some of the land will be wasted, and there will be fewer trees to earn the planter's income, while the cost of working the "waste" land will have to be met year after year.

Clearly, then, the design which allows of the arrangement of the greatest number of circles of adequate area per acre will (other considerations being equal) be the most profitable.

Types of Lay-out.

Only the five following systems of lay-out are considered here:—

No. 1—"The Square System."
No. 2—"Alternating Squares."
No. 3—"The Quincunx."
No. 4.—"The Row System."
No. 5—"Equilateral Triangles," or "The Hexagonal System."

The Square Lay-out consists in planting the trees at the intersections of equi-distant straight lines crossing each other at right angles. In other words, each of four adjacent trees will stand at one of the four corners of a square.

"Alternating Squares."—This system is a modification of No. 1, inasmuch as the trees in one row are not planted opposite those of the adjacent rows, but midway between them. This really results in planting in a series of triangles, but the triangles are not well proportioned.

The Quincunx is like No. 1, except that a centre tree is placed in the middle of each square. It is recommended only where the main orchard trees are likely to grow to great size and require very wide spacing. Under these conditions the centre space may profitably be filled by quick maturing varieties (such as peaches), which will have paid for themselves before the main trees demand their removal.

But planters should not fall into the error of thinking that because there is only one filler in the centre of four standards, the proportion is only one to four. The number of fillers and of standards is equal, and the real spacing is halved with many of the disadvantages of close planting. Only under exceptional conditions is Quincunx planting advisable.

The Row System consists in planting the trees in rows as grape vines are usually set, and for many reasons is only recommended where the trees are to be trellised like grape vines or are to act as windbreak.

The Triangular System disposes of the trees in equilateral triangles, and they also fall into truly straight lines, as in other systems. The method is recommended as being theoretically the most correct, both as regards equal disposition over the land, with least waste, and also for economical and convenient working and cultivation of the orchard. It should always be chosen unless some very strong local conditions forbid.

Comparison of Systems.

The only two systems of lay-out which need comparison here are "The Square," because it is so well known, and "The Triangular," because of its many merits.

Having decided that his trees will require a spacing of 24 feet apart, the planter will find that if he sets them in squares only seventy-five and a half can be planted per acre; but if in equilateral triangles, he gets nearly twelve more trees, or 15½ per cent. more per acre. This is illustrated by Diagram No. 1, which also shows a block of trees planted on the system of "Alternating Squares." In this diagram the "waste" land is shown in black, and inspection will prove that there is very much more "waste" with the lay-out in squares and alternating squares than in equilateral triangles. It is the saving of this waste which gives the triangular lay-out so many more trees in the same area of orchard.

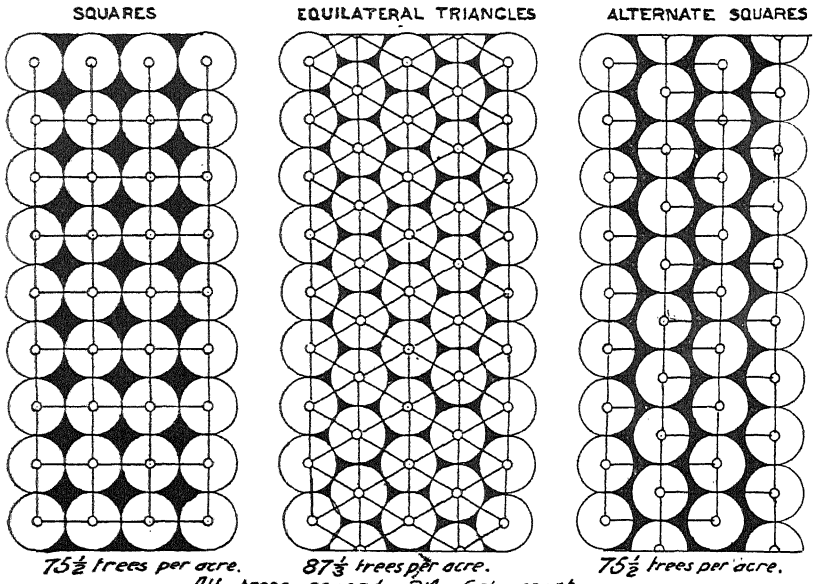
When planted on the "square," each tree is allotted a square of land 576 square feet in area, although it should only naturally fill a circle of 452½ square feet. It requires little more than three-quarters of the space we have given it.

If, however, we dispose of our trees on the "triangular" lay-out, each receives a block of land in the form of a regular hexagon, which so closely approximates to the form of a circle that there is very little "waste," and what there is can be filled by the tree's roots with very little crowding.

Nature appears to have taught the bee something of the advantage of the hexagon over the square. The honey cells of the bee's comb are always hexagonal, and not square, in form.

1

ORCHARD LAY-OUT

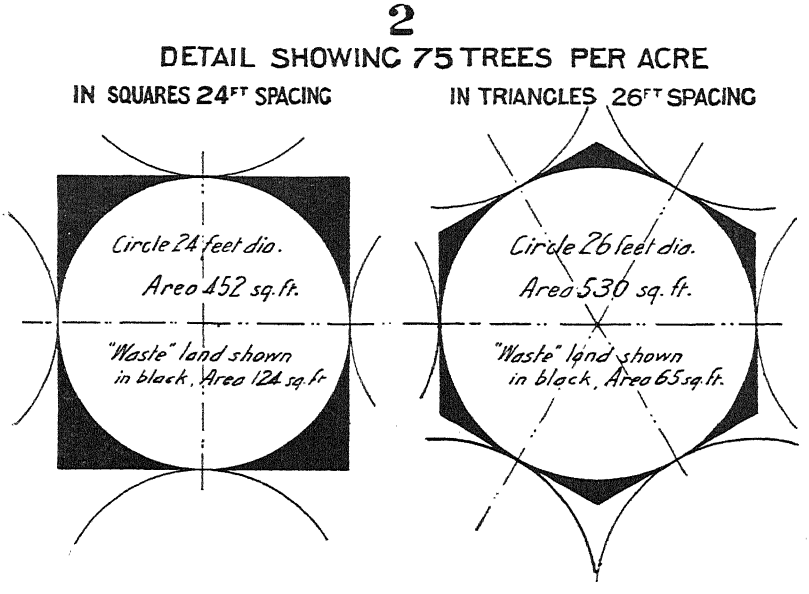


Instead of planting our trees 24 feet apart, we may decide to set a given number to the acre of orchard land. Suppose we decide to plant about seventy-five trees per acre (see Diagram No. 2), then if set "square" the spacing will be as before, but if we adopt the "triangle" we can give each tree an extra distance of almost exactly 2 feet greater spacing; it will live on a circle of 26 feet diameter, or 530½ square feet area, instead of one of 24 feet diameter, and only 452½ square feet.

The writer does not claim that an acre of land can be increased in area if triangles are drawn over it, nor reduced if marked out in squares. But if the trees are planted in triangles their roots will be more evenly distributed

than if set in squares, and the whole of the land can be made use of by the former method with very much less poking about of the roots to fill odd corners than if the latter lay-out had been chosen.

And many of the advantages which the trees derive from the triangular design are also felt by the men and teams which have to work the orchard. The triangles are formed by the intersections of three sets of straight lines, so that there are three main lines of roadway. But if the square method had been adopted, these main "lanes" would be reduced to sets of two instead of three. True, they are slightly narrower where the planting is triangular, but in driving through the orchard no two trees are passed at the same time: that on the right-hand will have been left behind before the vehicle comes abreast of the tree on the left, so that the man can watch both



and damage neither. But probably traffic is more greatly facilitated by the ease of turning in the triangular orchard than by any other element of its design. An inspection of Diagram 2 will show how closely the hexagon fits round a circle; the path of a turning vehicle or plough is approximately circular, so that it is easily kept within the hexagonal space provided. When turning from one lane to another in the square orchard the turn must be through an angle of 90 degrees; but in the triangular orchard this angle is only one of 60 degrees. The latter orchard, with its eighty-seven trees per acre, appears to escape from damage at least as well as those planted with only seventy-five trees on the "square."

When comparing the various systems of lay-out, it is only the sets of main lanes, or widest passages between the trees, in each design which should be considered; it is to these that the traffic will eventually be

confined, although the beautifully radiating, but narrower, lanes which are found in each system may be made use of while the trees are small.

In the square lay-out there are only two sets of main lanes crossing each other at right angles, but if the triangular design has been adopted the number of these wide passages will have been increased by 50 per cent., so that the orchard traffic can almost always find a convenient short-cut in the direction it wishes to take, and this alone saves much knocking about of the trees, because there is less turning, and what there is is through an easier angle.

Apple orchards are usually established on undulating sites. It is very important that the furrows of cultivation shall be taken in nearly level contours rather than up and down the slopes. If the furrows are nearly level it will be found that storm water will be encouraged to soak in and promote the welfare of the trees; but if the plough has been taken up and down the slopes, each open furrow will form a miniature creek, and the best of the plant-food and surface soil will be scoured away, whereas the same furrow, if level, instead of steeply sloping, will form a trap to hold the water and catch the particles of plant-food with which it is charged. Now, all ordinary hills and the ends of ridges approximate to the circular form. Diagram No. 2 shows how very much better the lines of triangular planting fit round a circle (and consequently round a circular hill or point of ridge) than do the lines laid out on the square system. In practice the ploughman finds it easy to follow almost level lines, and when a change in the slope of the ground is reached he has only to turn through an easy angle of 60 degrees in order to follow it; but if the orchard had been planted on the square the angle of turn would be much more severe, and the new direction of furrow would not be level, but so sloping as to encourage scour.

At those seasons of the year when thunderstorms are expected "up-and-down" ploughing is dangerous, but at other times cross cultivation can be followed with advantage. Either the square or the triangular lay-out permits of this work being done, but the balance is in favour of the triangle, because of the greatly reduced amount of expensive hand-work in keeping the orchard free of weeds.

From every point of view, both in practice as in theory, the triangular design is superior to the square; it is better for the trees and better for the men who work them, while its appearance is so pleasing that it has only to be seen to be appreciated. The writer recommends that it be adopted in all but very exceptional cases.

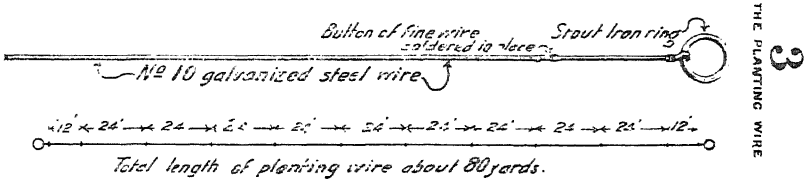
The Planting Wire.

No matter what the type of design may be, many measurements must be made in order that it be correctly laid down on the orchard ground. For this work there is nothing so handy as a planting-wire, and the small cost of making one will be more than repaid, even if only a very few acres have to be planted. It is made of No. 10 galvanized steel fencing wire, with an iron ring at each end, and soldered "buttons" to mark the graduations.

These buttons are easily made by twisting a few coils of fine wire round the main wire wherever a graduation mark is required, and soldering it in exact position. Before any graduation is attempted the plain wire should be very tightly stretched over even ground, so that the measurements along it can be easily and accurately made. It will be found convenient to make the little coils which form the buttons, and slip them on to the main wire before its end rings are fastened on.

The length of the planting wire should be as great as can be conveniently used over the uneven orchard land which is to be planted. The longer (within reasonable limits) the wire is made, the less will be the work of setting out the positions of the trees, and the greater the accuracy attained. The length of wire found most useful in laying out large orchards whose land is fairly even has been about 120 yards, but for general purposes 80 yards will be found sufficient. If the land is very uneven the length may with advantage be still further reduced, but it should be kept as long as possible.

The details of the planting wire will be made clear by an examination of Diagram No. 3, which shows a wire graduated for planting the trees with a spacing of 24 feet. About two or three feet from the end-ring the first



THE PLANTING WIRE. 3

button is soldered, then comes a distance of exactly 12 feet (half the distance of the selected width of spacing) to the next button, and then regular spaces of 24 feet each, until the other end of the wire is approached, when the distance to the last button is 12 feet and a short length to the last end-ring.

The use of the Planting Wire, and method of setting out the Orchard by means of Base-lines.

Instead of pegging out on the ground the position of each tree, it is recommended that the orchard be marked out from end to end with a system of base-lines. These should be parallel to each other, and spaced at such a distance apart that the two end buttons of the planting wire shall just reach from base-line to base-line when the wire is tightly stretched across between them at the angle required by the system of lay-out adopted. This angle will be one of 60 degrees if the planting is to be in equilateral triangles, and it will be a right-angle if the square system has been chosen. In either case the planting wire and the base-lines will be of equal value in accurately locating the positions of the trees. Each button on the planting wire (except the two end buttons, which are kept on the base-lines) will mark the position for a tree, and if desired a peg may be driven there,

but the author believes that the use of a peg to mark the tree's position is both confusing to the men and very wasteful of their time. The much better way is to plant the tree just beside the button of the wire, while the wire is still in position marking its exact place. If a planter once tries this method he will never bother with pegs and planting-boards again. There is no difficulty in digging the hole for the tree while the planting wire is in place; the button shows the exact position even after the soil has been removed in digging the hole, and it also indicates the original level of the ground, so that the man planting will know how deep to set the tree's roots, and be quite sure that when the hole is filled in the young tree will be found to be at the proper level.

After all the trees along the planting wire have been set, that is to say, after a tree is planted just beside each button, then the wire is lifted at each end and carried up to the next set of marks on the two base-lines, where it is staked down and tightly stretched, and another cross row of trees is planted as before.

The Base-lines.

The whole accuracy of the work depends on accurate setting out of the base lines. If the orchard were in the form of a long narrow strip of land, say only 100 yards wide, then a base-line should be carefully laid down parallel to one of the long fences, and near it, a second base-line parallel to the first is then laid down at the other side of the orchard, and as the planting wire is stretched from each pair of pegs on the two base-lines, the whole orchard will have been covered, and all the planting completed.

But usually the orchard is too wide to permit of a planting wire of convenient length being stretched from side to side, and in this case three or more base-lines will be required, and the orchard land will be covered by planting in successive long blocks, as wide as the planting wire will span.

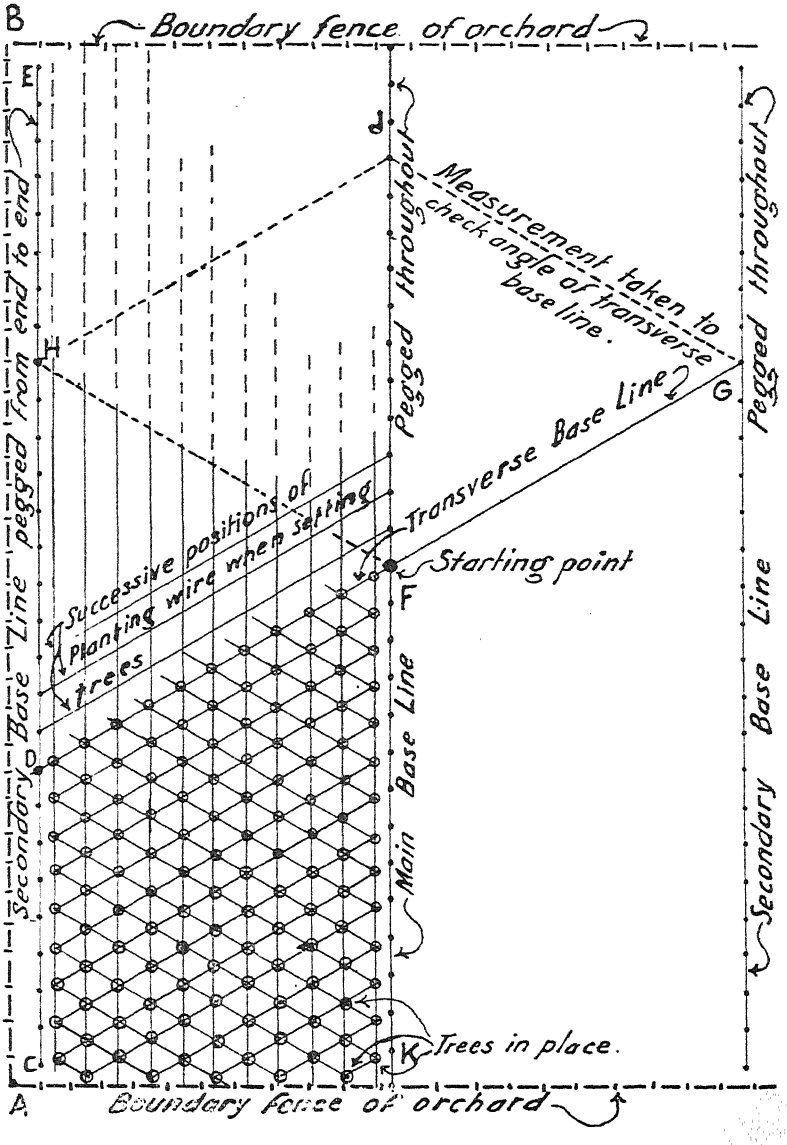
Setting out the Base-lines.

Unless special precautions are taken to prevent it, some inaccuracy is likely to be found in measurements taken over uneven ground. The simplest way for an untrained person to reduce these inaccuracies to within negligible limits is to begin his measurements near the centre of his orchard. The lengths of the measured lines are thus reduced, and the amount of error is also decreased; besides this, there is good chance of such errors as may creep in tending to counterbalance each other, and so disappear.

After having decided on the direction in which his lines of trees shall run, the planter will proceed to set out his base-lines in accordance therewith. Presuming that the planting is to be done in equilateral triangles, the method adopted by the writer is as follows (see Diagram No. 4):—Let AB represent the fence of the longest side of the orchard, and let it be understood that the longitudinal lines of trees are to be parallel with this fence, then the planter will stake out a line CDE, which must be quite straight and

4

Method of Lay-out by means of Base Lines



parallel with the fence. It will be used as a base-line, and should be located at such a distance from the fence that the nearest trees (which will be distant from it 12 feet along the planting wire) shall have the desired amount of clearance.

A stake should now be set up approximately at the point F, nearly in the centre of the orchard. The transverse base-line DFG will have to be marked out at an angle of 60 degrees with the line CDE, and its approximate direction is best found as follows:—Take a piece of binder twine or other cord about 50 yards long, tie the two ends together, and pass a large wire nail through the knot, so that it shall be firmly fixed; two other wire nails are then knotted into the twine so that there shall be exactly the same distance between all three. Now select a point D exactly in the line CDE, and drive one nail there, pull the cord tight between that nail and the next to it, and drive it in exactly on the line; now take the third nail and, pulling the cord tight between it and each of its two mates, mark the exact spot. This should give an equilateral triangle and mark the proper direction for the transverse base-line DFG. But it is probable that two or three trials will be required before the line is found to pass within, say, a few yards of F; when it does so, the point D can be finally fixed, although F is still to be definitely located. The exact position of F is found by stretching the planting wire from D in the direction of F, and then measuring its full length to H (exactly on line CDE), the distances between D—H, D—F, and H—F should be made exactly equal, we shall then know that the position F is correct, and the transverse base-line can be produced to the far side of the orchard. The distances F—G, F—J, H—J, and G—J should all be measured and found exactly equal to F—D. The line JFK can now be staked out perfectly straight, and, beginning at the point F, it must be marked out from end to end in spaces of exactly 24 feet; this is done with the same planting wire that has been used for all other measurements. The base-line CDE will be pegged, as will all other base-lines, into 24-feet spaces, the measurements being started where the transverse base-line crosses the others.

In staking out a straight line, a plummet with a fine hard string should be used. If it is held steadily at arm's length and the sight taken along the string, it will be found that the work is very much more accurate than if an attempt is made to sight more or less crooked sticks into line without a plummet. The pegging of the longitudinal base-lines is done with pine pegs about as thick as a man's thumb, and 9 inches long; they should stand up 3 inches.

Sometimes the whole of the land is ploughed and subsoiled before any marking out of the lines is done, but the writer prefers to mark out the orchard first, and after properly fixing the base-lines, the approximate positions of the long lines of trees can be easily staked, so that a strip of land say 12 feet wide may be ploughed and subsoiled for each line of trees. The base lines, of course, must not be ploughed out until the planting is done, but the

remainder of the orchard can be ploughed, and, for that matter, subsoiled at once, though it appears better practice, and cheaper, to only subsoil strips about 12 feet wide during the first year, and to subsoil the remainder during the next year or two, so that the soil shall be freshly loosened up as the roots extend towards it. The unploughed land between the strips is of great advantage while the work of planting is in progress; men and horses can walk on them instead of plodding through the ploughed land. Of course, the entire surface will be ploughed as soon as the planting is finished, even though some strips of subsoiling may be left for another year.

After having carefully established the main base-line nearly down the centre of the orchard, the measurements with the planting wire when the trees are being set should always be taken from this base. The man in charge of the planting should take the end of the wire which is worked along the main base line, while another man will pull it taut to the next base-line. The first will then stake down his end, so that the button near the ring shall be just even with the peg in the base-line, then the man at the other end will firmly stake his end of the wire in place, so that it passes just beside the proper peg in the second base-line. All the trees can now be planted along the wire, which will be moved up to the next two pegs in the base-lines, and another row of trees planted as soon as the wire is set. Sometimes the button at one end of the wire will not quite tally with the peg in the secondary base-line. There may be a difference of an inch or so; this is due to uneven ground over which the wire is stretched, and may be neglected if the other end is kept strictly to its place on the main base-line.

Although this method of planting is somewhat difficult to describe, it is really simple in practice; once the base-lines are properly set there should be no trouble and no delay. Quite inexperienced men will be found to properly set 100 trees per day per man, digging all holes and doing all the work, except the fixing of the base-lines, which is done, perhaps, weeks before. The lines of trees will be found so perfect that even if the trouble had been much greater, the result would have fully justified it. Men planting should always work in pairs; both will dig the hole together, throwing the surface soil on one side and the subsoil on the other; then a cone of surface soil having been formed in the bottom of the hole, one man takes the tree and plants it while his mate supplies him with soil sprinkled freely from the shovel until the roots are well covered. The planter then stamps the soil well round the tree, keeping it upright, and just touching the button of the planting wire, while the hole is completely filled by his mate. The two then go to the next tree.

When setting the last few trees in the corners of the orchard it will be found that the planting wire will have over-shot the end of one base-line, and that the positions of the remaining trees cannot be fixed as before. However, the trees which are set will line up so beautifully that the lines and positions of the few trees still to be planted are clearly shown; they can be easily measured, or even sighted in, with considerable accuracy.

ANSWERS TO CORRESPONDENTS.

(Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.)

GRUBS CAUSING BARE PATCH IN WHEAT.—H. J. M. LUSH: In the presence of a specimen of the grubs it is rather difficult to say what they may be, but probably, from their habits, they are grass-root lamellicorn beetles. These underground grubs are difficult to deal with; but, if the trouble is spreading from the centre, I would suggest working round the outer edges with a fork, and turning the soil over for the birds and other enemies of the grubs to get at them. All chemicals are too expensive, and difficult to apply in a crop such as wheat.—W. W. FROGGATT.

APPLES FOR THE MANGROVE MOUNTAIN DISTRICT.—"A.S.": The following should prove suitable for planting: Smith's Early Carrington, Rome Beauty, Jonathan, Granny Smith, and Trivett's Seedling. These can be planted as late as August. The suggestion, half apples and half citrus, is a good one, and if carried out the latter should consist of Parramatta and Late Valencia Oranges and Emperor Mandarins.—J. G. R. BRYANT.

SAN JOSE SCALE ON APPLE, PEAR, AND PEACH.—"M.L.": If the trees are badly affected an application of lime-sulphur wash, winter strength, at the present time, followed by another spraying just before the buds burst, should clean the trees thoroughly. In the middle of winter the Red Oil Emulsion is a good remedy.—J. G. R. BRYANT.

BOILING POTATOES FOR PIGS.—"H.B.": In experiments carried out with cooked *versus* raw potatoes, it has been noticed that some pigs eat the former more readily than the latter, but the results indicate that the feeding value of potatoes is not materially improved by boiling.—G. VALDER.

FRUIT TREES FOR THE CASINO DISTRICT.—"J.H.T.": In an area 2 chains by 1 chain approximately 22 trees can be planted. The following varieties should prove suitable:—Apples: Granny Smith and Carrington; Peaches: King Edward VII, Flat China, and Governor Rawson; Pears: China, and Keiffer's Hybrid; Plums: Kelsey and Satsuma.—J. G. R. BRYANT.

LIMING AN ORCHARD, &C.—"H.H.C.": The lime should be sown broad-cast throughout the rows (leaving unlimed) a space at least 3 feet from the butts and then harrowed in; 12 to 15 cwt. per acre should be applied. As regards bone-dust 8 to 10 lb. may be given every bearing tree. In a district where late frosts are experienced, prune as late as possible before the buds bursts.—J. G. R. BRYANT.

POTATOES ON BLACK SOIL.—"F.A.W.": While it is true that heavy stiff black soils are not suitable for potato culture, it is difficult to assign any specific reason. The crop prefers a free working soil, and anything which will improve its mechanical condition will benefit the growth of the potato. The application of farm-yard manure assists in this direction. An early maturing variety such as Bliss' Triumph or Satisfaction, should give best results. This class of potato keeps a better shape than most other varieties, and on account of its earliness the soil is not so compacted as in the case of a crop which occupies the ground for a longer period.—A. J. PINN.

BANANAS AND PINE-APPLES AT BELLINGEN.—"E.P.": To ripen bananas, when they are fully matured, it is better to remove them from the plants and hang them up in any warm place, sheltered from the weather. The Cavendish variety is the most suitable, while a few of the "Ladies' Fingers" variety might be tried. The latter is tall growing while the former is somewhat dwarf. Ripley Queen and Smooth-leaved Cayenne are the best varieties of pineapples. They may be planted out from August to end of December.—W. J. ALLEN.

SPROUTING ALMONDS.—"H.G.": For keeping and sprouting almonds, throw into the bottom of a box sufficient sand to cover an inch deep, then a layer of nuts, cover with another inch of sand, and so on, to within a few inches of the top. Afterwards water well with a sprinkler and again during the winter whenever the sand gets too dry. The sand has to be pretty well saturated with water, especially from about 1st July until planting time—August, September, or October, according to the locality. The nuts are then planted in drills and covered to a depth of 2 to 3 inches. Almonds are worked on their own stocks.—J. G. R. BRYANT.

SORGHUM ENSILAGE FOR HORSES.—"O.B.B.": Sorghum Ensilage has proved very suitable for cattle and sheep, in fact large quantities are used for feeding this class of stock. In the case of horses, however, great care must be exercised, as should any of the silage be at all musty it is likely to cause sickness and even death. In several instances cases have been reported in New South Wales of horses being killed through eating musty Sorghum Ensilage. With care, however, if fed in small quantities at first and mixed with other feed such as wheaten, oaten, or lucerne chaff, I do not see why it cannot be used successfully.—GEO. VALDER.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS.

Branch.	Honorary Secretary.
Albury	Mr. J. D. Lankester, Albury.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Beckom	Mr. S. Stinson, Beckom.
Bonville	Mr. H. B. Faviell, Bonville.
Borambil	Mr. H. A. D. Crossman, "Homewood," Quirindi.
Bungalong	Mr. E. Hughes, Oakleigh, Cowra Road, *viâ* Cowra.
Cardiff	Mr. F. B. Cherry, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Collie	Mr. C. J. Rowcliff.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coreen-Burraja	Mr. Wm. Stodart, Coreen, *viâ* Corowa.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Deniliquin	Mr. W. J. Adams, jun., Deniliquin.
Derrain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Erudgere	Mr. Frank Hughes, Erudgere.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. W. Smith, Henty.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit, *via* Manilla.
Kellyville	Mr. C. F. Boughton, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Portland	Mr. W. C. Gambrill, Lower Portland.
Mangrove Mountain ...	Mr. G. T. Hunt, Mangrove Mountain, *viâ* Gosford.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Moruya	Mr. P. Flynn, Moruya.
Narrandera	Mr. C. F. Pearce, Narrandera.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
New Italy	Mr. F. A. Morandini, New Italy.
Nimbin	Mr. J. H. Hutchinson, Nimbin.
Orangeville	Mr. C. Duck, Orangeville.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkesbourne	Mr. W. H. Weatherstone, Parkesbourne.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose-Kareela	Mr. L. Pieremont, "Vila," Penrose.
Redbank	Mr. J. A. Graham, Woodlands, McAlister, *via* Goulburn.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria Streets, St. Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.

Branch.	Honorary Secretary.
Stockinbingal	Mr. J. Neville, Stockinbingal.
St. John's Park	Mr. A. King, St. John's Park.
Tallawang	Mr. J. E. Hansall, Tallawang.
Taralga	Mr. Dave Mullaney, Stonequarry, Taralga.
Toronto	Mr. J. G. Desreaux, Esmond, Toronto.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Wyong	Mr. Edgar J. Johns, Wyong.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Demonstrations in Clearing Land and Subsoiling with Explosives.

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. H. C. Coggins, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Bee-keeping.

A series of lectures on bee-keeping is being arranged by Mr. R. G. Warry, Instructor in Apiculture. Secretaries, whose branches intend availing themselves of this opportunity to receive a practical insight into this branch of agriculture, are requested to make early application.

NOTES AND REPORTS FROM BRANCHES.

Albury.

A demonstration in clearing land and subsoiling with explosives was given to members of the above branch by Mr. H. C. Coggins, Assistant Inspector of Agriculture, on 21st May. The demonstration was entirely successful, and those present were greatly impressed with the possibilities of explosives in agriculture, especially as regards subsoiling for fruit and lucerne culture.

Carlingford.

A demonstration in pruning and grafting, given by Mr. J. G. R. Bryant, Assistant Fruit Expert, was held on the 17th May in the orchard of Mr. F. C. Cox, Carlingford.

The second annual report of this branch was submitted by the Hon. Secretary, Mr. John Neil, who said:—

The presentation of the second annual report of this branch affords the opportunity of glancing at our progress during the year just closed, in order that we may estimate (1) the extent to which we have achieved the objects for which the Bureau stands, and (2) see what we have left undone which we might have done in attaining those objects, which are, briefly, to raise the financial, intellectual, and social status of the man on the land.

Out of a membership of over thirty, there is much room for improvement in the attendances at meetings. It has, of course, to be admitted that, in all districts where the residences are scattered over a wide area, combined with the difficulty of choosing a time suitable to all concerned, fully attended meetings can hardly be expected. However, the success of the Bureau depends wholly on the interest and enthusiasm displayed by members in this direction, and if our organisation is to exercise the influence it should, members must endeavour to devote a little more time to it than hitherto.

Though rain is always a welcome visitor to the fruitgrower, it was nevertheless a disappointment that the day chosen for Mr. Bryant's demonstration on pruning in June last, was so wet. We were fortunate enough, however, to secure his services later on in the year, when he delivered a lecture on Pruning, Budding, and Grafting, and we look forward with pleasure to meeting him in a similar capacity during the coming year.

We again owe a debt of gratitude to Mr. Henry Lord for the presentation to us in characteristic fashion, of "Facts which should be known by the man on the land," and have no doubt that he will again favour us during the coming year.

Not the least important item on our syllabus during the past year has been the discussion on Spraying, to which three meetings were devoted without robbing it of its interest for still further consideration. Nor did it yield the palm to "Fumigation," the discussion of which extended over two meetings, notwithstanding that the latter is regarded in some quarters as the last thing as a cleanser and renovator of citrus trees.

A meeting was also devoted to the subject of Co-operation, which seems destined, notwithstanding its somewhat chequered career in the past, to yet win its way into the affections of Australian producers.

Our thanks are due to Mr. Rumsey for placing at our disposal, by way of an address, the information gathered by him as the result of a visit to that great national undertaking, the Murrumbidgee Irrigation Scheme. Also to another member, Mr. Fry, for opening a discussion on the use of explosives in agriculture, with much useful information gained from practical experience. We trust that the example of these two gentlemen will be followed by others. We have also to record our appreciation of Mr. W. G. Smith's loan to the Bureau of a microscope.

The holding of several meetings during the year at the May Villa School, in addition to serving the convenience of residents in that end of the district, also stimulated a wider interest in our work, and we hope to repeat the experiment during the coming year, with even better results.

We also intend to initiate a scheme for the encouragement of vegetable growing amongst boys, along the lines of the famous Corn Clubs which have been very successful in the United States, as a means of inculcating in the rising generation a knowledge of the principles of agriculture, and a desire to follow agricultural pursuits. A committee has been appointed to draw up a scheme which will, we trust, meet with the cordial approval of both parents and offspring.

Coonabarabran.

At the last meeting of this branch the following paper was read by Mr. D. Cameron :—

Threshing *v.* Harvesting Wheat, and the Advantages of the Former.

During May, 1903, I gave up the management of a sheep station on the Lachlan River, which property I controlled during the ten years' drought, which was general nearly all over Australia. I then travelled through all the States except Western Australia, and did not see one single straw stack, or, in fact, any other stack of fodder: evidently, if there had been any, they had all been used up during the drought.

I then went across to New Zealand, and whilst staying at Invercargill, South Island, visited several farms out in the country, and the first thing to be noticed was that almost every field contained a straw stack, some evidently having been there for years, and the thought occurred to me, "What would poor drought-stricken Australia give for some of those stacks?" The time I speak of was winter and the ground was covered with snow; the horses, cattle and sheep were feeding at the stacks, and the thought struck me, "What thousands of tons of good feed we were destroying every year by using the harvester instead of the threshing machine."

In New South Wales alone I venture to say we destroy one and half million tons of straw every year by the use of the harvester and stripper, and to this must be added the loss of about four million bushels of wheat. Our loss does not end here, because anyone who uses a stripper for two or three years finds that the paddocks are dirtied with black oats and other weeds. We have only to look at some of our own farms near-by when the crops are growing to see the effect of the use of the stripper and the sowing of dirty seed, by the wild oats that are growing.

The damage does not end here even, for every ton of chaff sold that has black oats in it helps to spread the pest. I would advise the farmers to be as particular about the chaff they buy as with their seed wheats if they desire to keep their land clean.

Loss to the Farmers as well as the State through the Use of the Harvester.

We will say for argument's sake that there are in New South Wales 2,000,000 acres under crop, and that we cut 500,000 acres for hay, leaving us with 1,500,000 acres for grain to be stripped; the loss at, say, 1 ton per acre at 30s. per ton would be £2,250,000, and this I consider a low estimate. Then we have to consider the quantity of grain lost during stripping, which I venture to say is 2 bushels per acre. This, at an average price of 3s., represents a further loss of 3,000,000 bushels at 3s., which is £450,000, or a total loss to the farmers of the State of £2,700,000 per annum.

The Advantages to be Derived from the Use of the Thresher.

In the first place the wheat can be reaped one month earlier than when stripped, and the consequence is that the straw has a large amount of nutriment left in it, and will cut up nearly as well as hay, especially when cut into chaff. My experience is that chaff alone is very little good to work horses on. No matter how good and green it is, if you want horses to work on it you must add the grain. Then you have the advantage of getting a better sample of grain, with very few cracked and no bleached grains; but the greatest advantage of all is that the paddocks are not dirtied, and all the oats and other rubbish can be destroyed.

My advice to farmers who have clean ground is never to use a harvester and to buy clean seed at whatever cost.

Build your straw stacks and thatch, and they will last for years and keep good. Mice will not interfere as they do with wheaten or oaten hay with the grain in. My opinion is that the harvester is one of the most incomplete and destructive machines ever invented and one of the farmer's greatest enemies.

Mr. Crane agreed with the speaker as to the great advantages to be gained by using the thresher, and instanced the fact that last year he only obtained 4 bags from a portion of a crop of wheat he stripped, whereas the balance, which he reaped and threshed, yielded 5 bags, although to all appearance there was no difference in the crop.

Mr. W. Bowsher also endorsed the argument of the previous speaker.

In reply to a query, Mr. Cameron said that from a crop only a foot high hardly any wheat would be stripped, but by reaping and threshing all could be saved.

Dr. FAILES championed the harvester, in the first place on account of its economy, and asked why had harvesters become so general and still held their reputation if there was such an advantage to be gained by reaping and threshing? He was of opinion that under present labour conditions and the additional cost of reaping, stacking, and threshing, that the advantages were in favour of the harvester.

He knew of an instance where a man, three seasons running, with his team and harvester had harvested 100 acres single-handed, and he had known men of limited capital start and succeed with a stripper, which with a thresher would have been impossible. As for the cost, he knew of one farmer who had thirteen men to assist with the thresher, and by the time threshing was finished they had eaten his crop.

As regards the harvester making the paddocks dirty, they all knew that it was very difficult to get rid of the black oat nuisance, and he failed to see how the reaping and threshing was going to do so, because most of the oats would have fallen before the wheat was reaped. He recommended the sowing of graded wheat only and more careful attention to the cleaning of the land. Mr. Cameron's paper dealt principally with large areas, but he doubted if it were practical under present conditions to obtain labour to stack and thresh 3,000 acres of wheat profitably.

Mr. CRANE said he was one who grumbled at the cost of getting his wheat secured in bags. This year he used a threshing machine, which was worked with five men. In threshing a crop for one man it cost him £5; the same crop last year cost £8 to strip, and he had the straw for his stock and got 3d. per bushel more for it.

Mr. CAMERON said he had no trouble about getting labour for threshing; he had threshed 1,600 bushels. In reply to a question, he said the proper time to reap was when the grain was full and beginning to get firm; it was not necessary to wait until the grain was ripe. In New Zealand the wheat was very often threshed in the paddock, thus avoiding the stacking before threshing.

A vote of thanks was accorded Mr. Cameron for his very able paper.

Departmental Note.—Mr. H. Ross, Instructor in Agriculture, points out that one ton of straw per acre is a very high estimate; the yield would probably be nearer half a ton for a 20-bushel crop—say about 12 cwt. per acre. The price at 30s. per ton is also considered an extremely high one, and not many seasons occur in which straw would be worth as much as this.

Crudine.

Arrangements are being made for a lecture on "Dairying" to members of the Crudine Branch by Mr. Pedersen, Dairy Instructor.

Cundletown.

Mr. A. E. Massy, M.R.C.V.S., Government Veterinary Surgeon, will deliver a lecture on "Parturition of Farm Animals" to members and others interested on 21st July.

Dubbo.

Mr. C. J. Sanderson, M.R.C.V.S., Government Veterinary Surgeon, has arranged a lecture under the auspices of the above branch on 4th August.

Gunning.

Mr. J. G. R. Bryant, Assistant Fruit Expert, will give a demonstration in pruning and grafting during July.

Inverell.

At the last meeting of this branch Mr. Pawley gave an interesting address on Red Oil Emulsion and its various uses. He also visited the orchard of Mr. Lewis and gave a practical demonstration.

Kareela—Penrose.

At an early date Mr. J. G. R. Bryant, Assistant Fruit Expert, will give a demonstration to the members of this branch, and will also judge the Pruning Competitions.

Katoomba.

Mr. J. G. R. Bryant, Assistant Fruit Expert, gave a demonstration on pruning to a number of local orchardists in the orchard of Mr. Chas. Wooller early in June.

Mr. H. C. Coggins, Assistant Inspector of Agriculture, gave a demonstration in subsoiling with explosives on the same day.

Kellyville.

The usual monthly meeting was held on the 3rd May in the public school to a fair attendance of members, when Mr. H. J. Rumsey gave a lecture on "The Murrumbidgee Irrigation Scheme." The lecture, which was illustrated with limelight views, was made very interesting.

The speaker described the building of the great dam, where a water surface of 12,000 acres will be impounded and the flow of water supplied for irrigating purposes 200 miles away, where the soil was eminently suited for irrigation. The land could be divided into three grades, and he considered the fine, sandy loam, timbered with pine, as ideal. The climate was good, the winter frosts not so severe as to damage the orange or lemon trees, while the low rainfall—16 inches per annum—permitted fruit-drying to be conveniently carried out.

Orchard fruits, raisins and currants do well. Tobacco growing and peanuts were doing well, and the growing of seed for market was worth considering. Dairying could be recommended on the area where lucerne grew so well. Six cuttings had been made in the year, each yielding 30 cwt. of hay. Fifty sheep per acre could be carried on this land, and bee-keeping should be a profitable occupation.

Good progress was being made by the settlers. A public school, school of arts, and hospital had been established. A bank was doing business; and though there were no hotels, there was a Government accommodation house, and a butter factory had been recently opened.

In all the area provision was being made for 7,000 farms, which should support a population of 35,000.

Mr. John Neil, President of the Fruitgrowers' Association of New South Wales, also gave a short and stirring address on the work and aims of his Association. The speakers were both heartily thanked for attending and for the addresses they gave.

Milbrulong.

A lecture on conformation and unsoundness of horses will be given by Mr. H. O. Oliver, M.R.C.V.S., Government Veterinary Surgeon, to members of the above branch at the July meeting.

Narrandera.

Mr. G. M. McKeown, Manager of the Wagga Experiment Farm, will deliver a lecture on "Dry Farming" to members of the above branch on the 16th July.

During May Mr. H. O. Oliver, M.R.C.V.S., Government Veterinary Surgeon, delivered a lecture to members of the branch and the public generally at Narrandera. Keen interest was taken in the lecturer's remarks, and he was accorded a hearty vote of thanks at the conclusion of his lecture.

Nelson's Plains.

The proposed lecture on dairying by Mr. F. Wigan, Dairy Instructor, had to be postponed owing to the bad state of the roads.

Orangeville.

At the May meeting of this branch, Mr. W. J. Moulder read a paper of which some extracts are given :—

COMMERCIAL FRUIT-GROWING.

Choosing a Site —The first thing to be considered is the selection of a suitable site for the purpose. An easterly or north-easterly aspect with a shelter-belt on the west and south-west boundary, with a little fall to allow of surplus moisture getting away quickly, is the best for an orchard.

Condition of the soil is largely responsible for the success or otherwise of an orchard. A loose loamy soil is preferable to a stiff clayey soil, which breaks up in hard lumps as it retains too much moisture in a very wet season, and dries out very quickly during a dry spell. There is a considerable area of suitable land for fruit-growing in the Orangeville district.

Very low frosty situations should be avoided for citrus trees, as severe losses may occur from that source.

Preparation of the Land.—The preparation of the land is the next operation to which attention has to be given. If the land is bush or forest land, the trees and stumps should be grubbed out to not less than 12 inches. The land should then be ploughed 4 or 5 inches, and allowed to lie in its rough state for a considerable time to enable the grass and leaves which may have been turned over to thoroughly decompose. The second ploughing should be deeper than the first, and if the subsoil should prove to be hard, it is a good plan to loosen it to a depth of 3 to 4 inches with a subsoil plough.

Planting of Trees.—The usual practice followed in the district has been to plant the trees 20 feet apart, but with more experience I consider 24 feet apart would be a better plan to adopt. The places where the trees are to be planted should be marked out with pegs or light stakes, and the soil in this particular part should be well worked and pulverised. August planting is advocated for citrus trees, and July planting for apple, pear, and other deciduous trees. This is a very important matter to bear in mind, and intending growers should think this well out before commencing to plant an orchard

It is a mistake for an orchardist to confine himself to one or two varieties ; yet again, on the other hand, it is not advisable to unduly multiply varieties, because the time has arrived when specialising in certain varieties pre-eminently suited for a particular district is a feature of fruit-growing. Again, it is much cheaper to handle a large quantity of one variety than the same quantity made up of a number of different sorts ; also, there is usually a better demand for large lines of standard sorts than for mixed consignments.

Another important factor to be considered is quality. There is a great difference in the value of choice fruit and that of medium to poor quality, and it will be found to be always the best payable method to adopt only good choice standard varieties.

Parkesbourne.

A branch of the Agricultural Bureau has been formed at Parkesbourne, to be known as the Parkesbourne and District Branch. The following officers were elected :--Mr. G. Brown, Chairman ; Mr. H. Bastin, Vice-Chairman ; Mr. John Brown, Hon. Treasurer ; Mr. W. H. Featherstone, Hon. Secretary.

Redbank (Laggan).

The office-bearers of the newly-formed branch of the Agricultural Bureau are :—Mr. T. Davy, Chairman ; Mr. J. N. McDonald, Vice-Chairman ; Mr. J. J. Cunningham, Hon. Treasurer ; Mr. J. A. Graham, Hon. Secretary.

Taralga.

The monthly meeting of this branch was held on the 24th May. Mr. James, of Tallong, was invited to give a pruning and tree-planting demonstration, and a lecture on fruit-growing, on some suitable date in July. Mr.

McGuire gave it as his opinion that Taralga could produce apples of superior quality to those grown at Bathurst. Mr. McGuire has had practical experience in both localities.

Mr. A. J. Pinn, Assistant Inspector of Agriculture, is arranging for a lecture on potato growing to members of the above branch.

Walla Walla.

A day in July has been set apart for a demonstration in clearing and subsoiling by explosives. Mr. H. C. Coggins, Assistant Inspector of Agriculture, will be the demonstrator.

Wolseley Park.

"Sheep for small farmers, their physical characteristics and suitability to different climates," is the title of a lecture to be delivered to members by Mr. J. W. Mathews, Sheep and Wool Expert, during July. The lecture will be illustrated by lantern slides. Mr. Mathews will also spend a day in the district to inspect farmers' flocks.

The demonstrations in land clearing and subsoiling with explosives, given by Mr. H. C. Coggins, Assistant Inspector of Agriculture, on the 24th May, under the auspices of this branch, proved highly educational, besides affording the residents of the district—about thirty five being present—a very enjoyable outing.

Explosives in Agriculture.

In his opening remarks Mr. Coggins stated that in the future explosives would take a prominent part in agriculture They could be handled with perfect safety by the use of common sense with a little practical knowledge; in fact, accidents were more frequent among persons grown careless through the constant use of them.

Having selected a sound tree, Mr. Coggins proceeded with his work, being ably assisted in the boring of the holes by Mr. P. Sawyer. Five holes were bored between the main roots on all sides of the tree about a foot from the butt, to a depth of 2 feet 6 inches, and at an angle of about 45 degrees to permit the charges being placed well under the tree. One hole was made to penetrate the tap root about 6 inches, the object being to sever it when the explosion took place. The correct method of placing the gelignite in the auger holes was shown. Before placing the plugs of gelignite (of which nine were placed in each hole, including the primer), each was sliced, but not severed, the object being to enable the whole number to be compressed or tamped into a solid mass in each hole beneath the tree. After tamping eight plugs of gelignite in each hole, Mr. Coggins showed how the primer should be inserted, which work requires a certain amount of care. Having inserted the detonators in the primers and placed the primers in position, the next thing was to tamp the charges. For this purpose a wooden tamper (never an iron one) was used. Slightly moist earth is the best for tamping, a little of which should be placed very gently around the primer, the remainder of the whole to be tamped firmly and tightly. This done Mr. Coggins connected all the primer wires, fastening two of them to the cable leading to the battery a hundred yards distant. The party now withdrew to a safe distance, the battery was operated, and the whole tree instantaneously rose bodily out of the ground amidst a dense cloud of dust, smoke and flying débris, all crowned by a terrific report—a novel spectacle for the onlookers.

Mr. Coggins next proceeded to show how the work of subsoiling was carried out. Subsoiling, he said, was highly profitable in fruit culture, or in preparing land for any deep-rooting crop such as lucerne. He had proved that a plug of gelignite placed well beneath the root system of old trees refusing to bear had a beneficial effect by causing them to bear large crops of good fruit.

In subsoiling fruit trees Mr. Coggins placed the gelignite plugs 20 feet apart, in rows, a plug in each hole, and 2 feet underground. Each explosion, he said, would loosen the soil 10 feet each way, thereby enabling the roots of trees to easily and quickly penetrate the soil. The difference between trees planted in the ordinary way by the spade, and those planted in subsoiled land, would be so marked at the end of one year as to give the impression that the latter were a year older.

When subsoiling Mr. Coggins used the common fuse and caps, the cost being estimated at slightly above 1d. per hole. The best time to subsoil, he said, was during dry weather. Subsoiling is cheaper than the older method of planting with the spade, besides, there is no wall or bank of solid earth to retard the growth of the roots, such as that around a spaded hole. Mr. Coggins showed how the cap was united with the fuse, strongly condemning the practice of pinching or crimping with the teeth, instead of the crimper, a tool specially made for the purpose. The cap was now placed about two-thirds of its own length into the gelignite, which was placed in the hole—prepared with an earth auger—and tamped, leaving 4 or 5 inches of fuse above the surface of the ground. The fuses were lighted simultaneously, and when the explosions took place, the vibration of the soil was distinctly felt by the bystanders, a distance of 10 or 12 feet from each hole. Mr. Coggins strongly advised that should a charge fail to explode, it should on no account be interfered with. In such a case another charge should be put down about a foot away; the one would then explode the other.

In conclusion Mr. Coggins gave a few hints :—

Keep the gelignite and caps dry; gelignite is very sensitive when frozen; if it does freeze never place it near the fire or in the sun; the best plan to thaw it is to place it in a manure heap and cover over, or in a vessel placed within another containing hot water; never use it in a frozen state; do not smoke at the work; when clearing always place the same number of plugs in each hole beneath the tree.

A battery was estimated to cost £3 10s., cable 15s., gelignite 1s. per lb., tape fuse 9d. per coil; earth augers 6s. each.

A hearty vote of thanks to Mr. Coggins concluded the demonstrations, which occupied three hours.

Owing to want of space a paper read by Mr. E. Woodbourne on "Clearing of Virgin Land" is being held over until next issue.

Wyong.

Mr. N. Baker read the following paper on apple-growing to members of this branch at the last meeting :—

Apple-growing at Wyong.

When planting out an apple orchard, it will be as well to make note of the following:—Soil, site, and drainage.

Apples will grow in a large variety of soils. We find them doing well in the poor sandy and rich loamy soils of the coast, and on the granite and heavy soils of the interior.

The best site for an orchard in this country is one with a north-easterly to easterly aspect, well sheltered from the south and west. If not naturally sheltered by hills or belts of timber, it would be as well to plant a breakwind. I myself prefer the Pinus Insignis (planted alternately in a double row), as it will grow to a great height and grows almost anywhere.

Drainage.—If an orchard is not naturally well drained, it will require to be artificially drained, so as to carry off all surplus water and so prevent the land from becoming soured.

Some of the advantages of a well drained against a badly drained soil are, that after heavy rains, cultivation can be commenced sooner, the ground is always warmer, and it retains moisture better in dry weather. Surface drains could also be made to carry off a great deal of the rainfall in winter. In making surface drains, width should be taken into consideration more than depth.

When ordering trees from the nurseryman be sure and stipulate that the trees are worked on blight-proof stocks, the stocks usually selected being Northern Spy and Winter Majetin. This only ensures the roots and the portion below the graft being free from blight, the upper part having to be controlled by spraying or fumigating.

Varieties to plant.—Only those varieties that are doing well in each particular district should be planted, if grown for commercial use. The following varieties have proved to do well in this district. Trivett's Seedling, Jonathan, Granny Smith, Rome Beauty, and *Red* Carrington. In Carringtons there is both red and striped, the red being the best, as it is a better keeper and a highly coloured apple which nearly always has the best sale. Cross-pollination should be taken into consideration when planting out a large area of trees, by changing the varieties every three or four rows. The above mentioned varieties blossom about the same time, with the exception of Rome Beauty, which is about a week later. The distance apart at which to plant the trees varies from 20 to 25 feet each way.

If grown for commercial use it would be best to confine to a few well tried varieties, so as to have enough of one sort to send away to market. Apples grown in the coastal districts are not, as a rule, long keepers, and therefore only suitable for close markets, but in Sydney we have one of the best markets in the world, especially for early apples, such as Trivetts and Carrington. Local growers are far behind the times in marketing. If they would only put their fruit up in neat clean cases and line their cases with white lining paper and wrap their apples, and above all faithfully grade all fruit, they would find that the extra trouble entailed would well repay them, besides making a name for their fruit on the market. One has only to walk through the market to see how the buyers discriminate between the different brands. To show how the different growers become known, many buyers never bother to look at the fruit but just go by the brand, but let them be taken down once and it is a case of "once bitten, twice shy." Many unscrupulous people obtain the empty cases of well known growers and fill them with inferior fruit from their own orchards, and so spoil the reputation of the careful grower. I would like to see this Association take the matter up and see if something cannot be done to combat this evil. I would suggest that every fruit-grower should have a registered brand and that the Government should pass a law to that effect and make it finable for anyone to sell fruit in any but their own packages; not only fine the grower, but the agent as well for disposing of it. I do not think that the law would have much effect unless the agents were made responsible as well, because there are not many who would care to run the risk if they knew they were subject to a heavy fine. The fruit inspectors could see that the law was carried out.

Pruning.—For the first three or four years the trees should be pruned back pretty hard, so as to get strength and stability into the limbs and also to form a shapely tree. If after this time the trees still show a tendency to put on excessive growth with little show of fruit, they may go for a season with little or no pruning. This will have the effect of checking growth to a certain extent and encouraging the production of fruit spurs.

Spraying.—In spraying, whatever spray is used or for whatever purpose the tree is sprayed, let it be thoroughly done or not at all, as it is only a waste of labor and money if the work is slummed; and again, any fungus, scale or insect pests that escape the spray will soon multiply and become as bad as ever.

Manuring.—All orchards require manuring sooner or later, some more than others. You cannot expect trees to go on bearing heavy crops year after year, unless they are supplied with the necessary plant-food. Different soils and different localities may require different treatment, and it is largely a matter of experimenting to see which pays best. The Department of Agriculture issues a bulletin on "Manures and Manuring," which gives some valuable information (obtainable free).

I believe in clean cultivation during the summer when the trees require all the moisture they can get, and then in autumn a green manurial crop could be sown, such as field peas to be ploughed in in early spring; this adds both humus and nitrogen to the soil. If artificial fertilisers are used, I think the best time to apply them would be about July or August, before the sap begins to flow. If applied later, when the trees are starting into growth, the sudden access of plant-food may interfere with the setting of the fruit.

Liming.—A lot of our orchard land would benefit by an application of lime. Boggy or wet land should be drained before lime would be of any use to it. A simple test to ascertain if the land requires liming is to place a piece of blue litmus paper (procurable from a chemist) in the centre of a ball of moist earth and leave it there for a couple of minutes; if the paper changes to pink it is an indication that the land is deficient in lime.

Pests.—By far the worst pest attacking apples at present is Woolly Aphis or American Blight. As these, like all aphides, remain with their suckers embedded in the bark, it is useless to spray with poison as for leaf-eating insects, and as water will run off the woolly material with which they are covered, the only effective spray is one of an oily nature such as will adhere and kill by contact.

For a winter spray Red Oil is the most effective, and whichever brand is used care must be taken to follow the directions supplied as to mixing, application, &c., and to see that a perfect emulsion takes place, because if any free oil comes into contact with the tree it will burn the bark. Kerosene emulsion is also used.

As a summer spray, the following tobacco wash has been used with good effect by Mr. Grant on the Bathurst Experiment Farm :—

25 lb. of tobacco refuse steeped in 25 gallons of water, to which is added about ¾ lb. washing soda for the purpose of extracting the nicotine. Simmer for about an hour and dilute to 80 gallons of water. About 5 lb. of soft soap dissolved in a gallon of hot water is added to above. This mixture is effective if applied in a hot condition and with great force.

Some growers are fumigating to keep this pest down.

Last meeting I mentioned how I spent nine months on one of the leading orchards in the Bathurst district (Mr. H. S. Wark's) where there are about 40 acres of trees, and in the whole orchard there were not more than 20 trees affected. If a tree was noticed with Woolly Aphis on, a piece of white rag was tied to one of the branches, so that it could be picked out easily, and the trees would be inspected every two or three weeks and any effected spots dabbed with salad oil. Of course this would not be practicable on an orchard where it had gained a strong foothold, but on a young orchard or where the trees are not yet affected it would be a good plan to follow.

Codlin Moth.—This pest, which caused so much havoc among apples and pears a few years ago, is now fairly easily controlled by arsenate of lead spraying. The brand used almost exclusively now among the Bathurst orchardists is "Electro Powdered Arsenate of Lead," it being just as effective as the paste, easier to mix, and a saving in freight, as in the paste there is a large percentage of water.

San José Scale.—This can be controlled in the winter by spraying with red oil or kerosene emulsion, the same as for Woolly Aphis, and in the summer by lime-sulphur solution.

Mussel Scale and Red Spider, can also be controlled with the red oil.

All leaf-eating insects can be kept down by spraying with arsenate of lead. Black Spot or Scab of the apple and Powdery Mildew, a whitish powder which covers the tips of the shoot, are fungus diseases and need to be controlled by a fungicide such as Bordeaux mixture or lime-sulphur. Lime-sulphur is both a fungicide and insecticide. Many growers mix the Bordeaux for Black Spot with the arsenate of lead when spraying for Codlin Moth, and so kill two birds with the one stone.

But if spraying when the fruit is advanced, a weaker solution of Bordeaux than ordinary should be used, as there is a danger of it causing the fruit to russet.

Bitter Pit.—This is an obscure disease that has puzzled both growers and experts alike. At the present time the Federal Government have Mr. D. McAlpine investigating this disease. Cleopatra or New York Pippin seems to be more subject to this disease than other varieties. I have seen a crop of this variety with 25 per cent. affected, and there are plenty of worse cases than that.

Positions for various fruits in a mixed orchard.—If the orchard is on a slope the highest part should be allotted to apricots and then on in the order named down the slope :—Peaches and Nectarines, Plums, Apples, Pears, and Quinces. If the situation is sheltered and climate suitable, the citrus family should be planted near the centre of the plantation.

The "Diamond Bird."

Mr. Alfred F. H. Stephen, Talawanta, Polkolbin, forwards a small bird for identification, which to the best of his belief is a perfect stranger to the neighbourhood.

Mr. W. W. Froggatt reports : The bird is the Spotted Pardalota, commonly known as the "Diamond Bird" (*Pardalotus punctatus*).

These beautiful little insectivorous birds are not uncommon even near Sydney, and build their nests on overhanging banks, burrowing a circular hole some distance into the earth and lining the end of the nest with bits of fine bark, etc. This bird was figured in the *Agricultural Gazette*, Vol. VII, 1896, where a short description of the bird was given.

Orchard Notes.

W. J. ALLEN.

JULY.

Bitter Pit.

THERE are several experiments which may be tried for controlling this trouble, among which are liming; watering a few trees in order to keep up a good supply of moisture; drainage; spraying trees with lime and sulphur solution about the time they are breaking into blossom; and in pruning keep them well opened out so that all the fruit has plenty of light and sunshine. A too dense growth or too much shade should not be encouraged after the tree has commenced to bear.

Wherever varieties are found to be affected from year to year, no time should be lost in either grafting or budding such to the best export varieties which are considered to be fairly free from the trouble.

Grafting and Budding.

Grafting may be done in spring, just when the buds begin to swell; or budding in the fall, while the bark raises readily. If it is desired to bud in the spring, scions with well developed buds may be cut this month from picked trees which have borne good fruit. Place these in cold storage, where they may be kept until the young trees are ready to bud in the spring, when they may be inserted. As soon as it is discernible which have taken, the branch may be cut back, when it will be found that these buds will soon make a growth, and will then need to be tied to a stake in order to prevent them being blown off.

In budding it is well to put in plenty of buds, so that if a few do not take there will be enough left from which to start the new top. The bud should always be inserted about where it is desired to have a branch. This will ensure a well-formed tree, which should carry some fruit the second year. All cuttings for grafting should be heeled in the ground in a cool, damp place.

Planting.

Where orchards are to be planted, the land should be in readiness to plant citrus fruits, as well as apples, pears, &c. The latter trees should be put in this month, while the citrus trees may be planted either at the end of August or early in September. In cold late districts only plant varieties of apples and pears suitable for export.

Refills.

All refills other than citrus fruits should be planted with as little delay as possible now.

Pruning.

The most important work during this month is the pruning, which must be pushed on as fast as possible now, so that it will be completed and the ground well ploughed while it is still moist. Each and every tree has its own individuality, and, therefore, the grower should study the habits of the different trees, and prune them in such ways as will ensure that they will return him the best fruit from year to year. Both old and young trees are full of fruiting spurs and buds this season, and, therefore, the grower will be justified in removing more wood than usual this pruning, in order to prevent his trees from overloading. Weak trees may have their leaders well shortened back. Burn all prunings as soon as possible. The most expeditious way to accomplish this it to mount an old tank on wheels with grating in bottom.

While pruning or working around the trees, always keep a sharp lookout for any diseases which are liable to attack them, and mark any tree so affected.

Apply stable manures this month.

Citrus fruit handling, packing, and marketing are continued this month.

Scrape and burn loose bark from apple, pear, and quince trees.

Orchards should be kept in thorough order from 1st August until 1st April each year.

Fumigating Citrus Trees.

A successful fruit grower states that he prefers winter fumigation. He then uses No. 2 Table with, he claims, the very best results He says he can proceed with the work in the daytime, and can then operate more easily than at night, and with no more likelihood of damaging the trees.

STALLION PARADES FOR AUGUST, SEPTEMBER, AND OCTOBER, 1913.

Date.			Place.	Time.
Monday,	4	August	Dubbo	10 a.m.
Tuesday,	5	,,	Gilgandra	2 p.m.
Wednesday,	6	,,	Albury	10 a.m.
,,	6	,,	Gulargambone	2 p.m.
Thursday,	7	,,	Coonamble	2·30 p.m.
Wednesday,	13	,,	Temora	10 a.m.
Thursday,	14	,,	Barmedman	2 p.m.
Friday,	15	,,	Wyalong	11 a.m.
Saturday,	16	,,	Ariah Park	11 a m.
Monday,	18	,,	Ardlethan	2 p.m.
Tuesday,	19	,,	Oberon	10 a.m.
Wednesday,	20	,,	Bathurst	11 a.m.
,,	20	,,	Blayney	3·30 p.m.

STALLION PARADES FOR AUGUST, SEPTEMBER, AND OCTOBER, 1913—*continued.*

Date.			Place.	Time.
Thursday,	21	August	Millthorpe	11·30 a.m.
Friday,	22	,,	Orange	10 a.m.
Monday,	25	,,	Newcastle	2 p.m.
Tuesday,	26	,,	Canowindra	1·30 p.m.
,,	26	,,	Tamworth	10 a.m.
Wednesday,	27	,,	Cowra	10·30 a.m.
,,	27	,,	Scone	11 a.m.
,,	27	,,	Muswellbrook	2·30 p.m.
Thursday,	28	,,	Singleton	2 p.m.
,,	28	,,	Lyndhurst	3 p.m.
Friday,	29	,,	West Maitland	2 p.m.
Monday,	1	September	Warialda	2 p.m.
Tuesday,	2	,,	Bingara	3 p.m.
Thursday,	4	,,	Inverell	2·30 p.m.
Wednesday,	10	,,	Gulgong	11 a.m.
,,	10	,,	The Horton	10 a.m.
Thursday,	11	,,	Mudgee	10 a.m.
,,	11	,,	Barraba	Noon.
Friday,	12	,,	Rylstone	10 a.m.
,,	12	,,	Manilla	10 a.m.
Monday,	15	,,	Liverpool	10·30 a.m.
,,	15	,,	Penrith	11 a.m.
,,	15	,,	Wollongong	2 p.m.
Tuesday,	16	,,	Gundagai	10 a.m.
,,	16	,,	Luddenham	10 a.m.
,,	16	,,	Kiama	10 a.m.
,,	16	,,	Dapto	4 p.m.
Wednesday,	17	,,	Adelong	2 p.m.
,,	17	,,	Nowra	10 a.m.
Thursday,	18	,,	Tumut	2 p.m.
,,	18	,,	Denman	10 a.m.
Friday,	19	,,	Merriwa	Noon.
Monday,	22	,,	Camden	Noon.
,,	22	,,	Wyong	11 a.m.
Tuesday,	23	,,	Milton	10 a.m.
,,	23	,,	Crookwell	11 a.m.
,,	23	,,	Raymond Terrace	2 p.m.
Wednesday,	24	,,	Moruya	10 a.m.
,,	24	,,	Gunning	11 a.m.
,,	24	,,	Lithgow	2·30 p.m.
Thursday,	25	,,	Yass	10 a.m.
Friday,	26	,,	Cobargo	10 a.m.
,,	26	,,	Burrowa	10 a.m.
Saturday,	27	,,	Bega	10 a.m.
Monday,	29	,,	Moss Vale	2 p.m.
,,	29	,,	Gosford	11 a.m.
,,	29	,,	Bombala	11 a.m.
Tuesday,	30	,,	Taralga	Noon.
,,	30	,,	Tenterfield	11 a.m.
,,	30	,,	Cooma	11 a.m.
Wednesday,	1	October	Goulburn	10 a.m.
,,	1	,,	Glen Innes	10 a.m.
Thursday,	2	,,	Braidwood	10 a.m.
,,	2	,,	Guyra	10 a.m.
,,	2	,,	Adaminaby	9·30 a.m.
Friday,	3	,,	Queanbeyan	10 a.m.
,,	3	,,	Armidale	9·30 a.m.
,,	3	,,	Uralla	3 p.m.
Saturday,	4	,,	Walcha	2 p.m.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull	Sire.	Dam	Stationed at—	Engaged up till
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (im.)	Wollongbar Farm	*
,, ...	Imperialist ...	Florio	Lady Nancy of Minembah.	,, ,,	*
,, ...	March Pansy ..	Earl March ..	Australian Pansy	Grafton Farm ...	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
,, ..	Thessalian II. ..	Thessalian (imp.).	Egyptian Princess (imp).	,, ,,	*
,, ...	Elaine's Heir ...	Thessalian II ...	Wagga Elaine	Yanco Farm ...	*
,, ...	Royal Blood ...	Berry Melbourne	Calceolus ...	Wollongbar Farm	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie .	Berry Farm ..	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Wagga Farm ..	*
Guernsey ..	The King's Mirror	Calm Prince ...	Vivid (imp.)....	Kyogle	22 Dec., '13.
,, ..	Star Prince ...	Calm Prince ...	Vivid (imp.)....	,, ...	5 Mar., '14.
,, ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Maclean	2 Dec., '13.
,, ..	Prince Souvia ...	Vivid's Prince...	Souvenir(imp.)	Grafton ...	31 Dec., '13.
,, ..	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras	Wollongbar Farm	†
,, ..	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '13.
,, ...	Sunshine ...	King of the Roses	Princess Vivid	Grafton Farm ...	*
,, ..	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	Claudius (imp.)	Golden Star II..	Claudia's Pride(imp.).	Tweed River ...	18 Aug., '13
,, ..	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
,, ..	Good-bye ...	Western Duke...	Souvenir (imp.)	Wollongbar Farm	†
,, ..	The Peacemaker	Calm Prince ...	Rose Petersen	Jones Island ...	31 Dec., '13.
,, ..	King of the Roses	Hayes' King ...	Rosey 8th (im.)	Bega	1 Dec., '13
,, ..	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Wollongbar Farm	†
,, ..	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel(imp.).	Murwillumbah ...	10 Nov., '13.
,, ..	Prince of Warren Wood (imp).	Kingsmoor Governor (1952)	Quail (7051)	Macleay River ...	1 Dec., '13.
,, ..	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Frederickton ...	14 Dec., '13.
,, ...	Rosehill (imp.)..	Northesk (2073)	Faultless Footsteps (6132)	Raymond Terrace	19 Sept., '13.
,, ...	Duke of Orleans	Godolphin Arthur (1664)	Flower of the Preel 3rd (imp.)	H.A. College, Richmond	*
Ayrshire .	Jamie's Heir ...	Jamie of Oakbank	Miss Prim ..	Wollongbar Farm	*
,, ..	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ..	*
,, ...	Orphan Boy ..	Songster of Greystanes.	Rosamond ...	Glen Innes Farm..	*
,, ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A.College, Richmond	*
Kerry... .	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin(imp.)	Bratha 4th ..	,, ,,	*
,, ...	Rising Sun	Bratha's Boy ...	Dawn ..	Bathurst Farm ...	*

* Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.

Department of Agriculture,
Sydney, 2nd July, 1913.

BULLS FOR SALE

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEYS.—St. Michael of Wollongbar : sire, Trequean Mike (2103); dam, Polly 2nd of Roque Balan (imp.); calved 21st August, 1911. Price, **£40.**

Polly 2nd of Roque Balan (imp.) yielded 4,157 lb. of milk, equal to 235 lb. of butter.

Earl of Bath : sire, Monsieur Beaucaire; dam, Miss Jasmine; calved 10th December, 1911. Price, **£35.**

AT BERRY EXPERIMENT FARM.

JERSEYS.—Ladas : sire, Berry Melbourne; dam, Lally Optician; calved 11th November, 1911; colour, whole fawn. Price, **30 guineas.**

Lally Optician is by Sir Jack from Bellona. Bellona was by Optician (imp.) from Pattibelle (192). Pattibelle (192) was by Lily's Boy (imp.) from Claribelle (imp.)

Sir Jack is by Omelette's Pride from Lady Tidy 3rd (imp.).

Omelette's Pride was by Lucy's Pride from Rum Omelette (imp.).

Lucy's Pride was by Melbourne (imp.) from Miss Lucy 3rd (imp.).

Lally Optician gave 4,177 lb. of milk on her second calf, testing 6·2 per cent., equal to 299 lb. of butter last season.

Bellona gave 4,362 lb. of milk, testing 5·9 per cent., equal to 304 lb. of butter.

Foxtail : sire, Xmas Fox (imp.); dam, Bellona; calved 24th April, 1912; colour, whole fawn. Price, **20 guineas.**

(Bellona's breeding is shown above, also milk yield.)

GUERNSEYS.—Belfast : sire, King of the Roses (imp.); dam, Flaxy II; calved 20th September, 1911; colour, lemon and white. Price, **40 guineas.**

Flaxy II is by Rose Prince (imp.) from Flaxy (imp.). Flaxy II's only record is 3,333 lb. of milk, testing 5 per cent. (in 1911), equal to 197 lb. of butter. Flaxy (imp.) in 37 weeks gave 6,443 lb. of milk, producing 334 lb. of butter.

Haymaker : sire, The Peacemaker; dam, Hayes Muzette 7th (imp.); calved 5th January, 1912; colour, lemon and white. Price, **40 guineas.**

The Peacemaker is by Calm Prince from Rose Petersen.

Calm Prince is by Rose Prince (imp.) from Gentle (imp.).

Rose Petersen is by Peter (imp.) from Rose Petal. Rose Petal is by Rose Prince (imp.) from Saucy Sal (imp.).

Hayes Muzette 7th (imp) in 1911 yielded 5,620 lb. of milk, testing 4·6 per cent, equal to 304 lb. of butter.

AT COWRA EXPERIMENT FARM.

JERSEY.—Shakespeare : sire, Sir Pat; dam, Leading Lady; calved 13th January, 1912; colour, whole fawn. Price, **20 guineas.**

Leading Lady is by Berry Melbourne from Lady Tidy 4th.

Lady Tidy 4th was by Golden Lord from Lady Tidy 3rd (imp.).

Berry Melbourne is by Melbourne (imp.) from Rum Omelette (imp.).

Sir Pat is by Sir Jack from Pattibelle (192).

Leading Lady, on her first calf, yielded 3,346 lb. of milk, testing 6 per cent. equal to 237 lb. of butter.

BULLS FOR SALE—*continued.*

AT WAGGA EXPERIMENT FARM.

JERSEY.—Aitua's Lad : calved 14th June, 1911, No. 238 ; sire, Kaid of Khartoum. Price, **£25.**

Dam, Wagga Aitua, A.J.H.B., 787, by Colleen's Golden Lad, A.J.H.B., 119.
G.D., Wagga Ranee, A.J.H.B., 793, by Coral's Lad.
G.G.D., Wagga Empress, A.J.H.B.,785, by Neat Lad.
G.G.G.D., Maggie, by Lucius King.
G.G.G.G.D., Jessie, by Well Done.
Kaid of Khartoum, by Sir Jack, from Egyptian Belle.
Coral's Lad, by Mabel's Prince (imp.), from Coral (imp.)

MILK YIELDS.

	lb.	Test.
Empress	6,293	4·2 per cent.
Ranee (first calf)	4,642	4·6 ,,
Aitua	4,466	5·2 ,,

HOLSTEIN COWS FOR SALE.

BERRY EXPERIMENT FARM.

Name.	Date of Birth.	Sire.	Dam.	Price.
				£
Lolkje Field (in calf)	12 Nov., 1904 ...	Garfield	Lolkje	20
Marjorie (in calf)	5 Sept., 1906 .	Chairman	Margaretha ...	30
Fraulein Arama (in calf) ..	4 Feb., 1907 ...	The Hague ...	Dina's Douwe ..	25
Marigold (in calf) ...	25 Feb., 1907 ...	The Hague .	Margosa	25
Maggie Hague (in calf) ...	28 Aug., 1907 ...	The Hague ...	Maggie Obbe ...	30

GEORGE VALDER, Acting Under-Secretary.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1913.

Society.	Secretary.	Date.
Wentworth P., A., and I. Society	... W. B. Crang	... July 17
Deniliquin P. and A. Society	... L. Harrison	... ,, 17, 18
Peak Hill P., A., and H. Association	... A. Yeo ...	... ,, 30, 31
Narrandera P. and A. Association	... W. T. Lynch	... Aug. 5, 6
Forbes P., A., and H. Association	... J. H. Bates	... ,, 19, 20
Murrumbidgee P. and A. Association (Wagga)	... A. F. D. White	... ,, 19, 20, 21
Corowa P., A., and H. Society	.. John D. Fraser	... ,, 26, 27
Gunnedah P., A., and H. Association	... M. C. Tweedie	... ,, 26, 27, 28
Barmedman A. and H. Society	... P. H. Sheehan	... ,, 27

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1913.

Society.	Secretary.	Date.
Parkes P., A., and H. Association	G. W. Seaborn	Aug. 27, 28
Ariah Park P., A., H., and I. Association	J. N. Taylor	Sept. 2, 3
Wellington P., A., and H. Society	A. E. Rotton	,, 2, 3
Manildra P. and A. Association	C. M. Podmore	,, 3
Germanton P., A., and H. Society	J. S. Stewart	,, 3, 4
Junee A. Association	T. C. Humphreys	,, 3, 4
Young P. and A. Association	T. H. Tester	,, 9, 10, 11
Albury and Border P., A., and H. Society	W. I. Johnson	,, 9, 10, 11
Cootamundra A., P., H., and I. Association	T. Williams	,, 16, 17
Cowra P., A., and H. Association	G. S. Fisher	,, 16, 17
Ganmain A. and P. Association	J. F. Ashwood	,, 16, 17
Murrumburrah P., A., and I. Association	J. A. Foley	,, 23, 24
Canowindra P., A., and H. Association	G. Newman	,, 23, 24
Riverina P. and A. Society (Jerilderie)	J. Kennedy	,, 24
Hay P. and A. Association	G. S. Camden	,, 30, Oct. 1
Yass P. and A. Association	W. Thomson	Oct. 1, 2
Millthorpe A., H., and P. Association	C. J. E. Hawken	,, 7, 8
Hillston P. and A. Association	S. J. Gordon	,, 8
Crookwell A., H., and P. Society (Spring Show)	H. P. Levy	,, 10
Balranald P. and A. Society	A. Malcolm	,, 15
Tweed River Agricultural Society (Murwillumbah)	A. E. Budd	Nov. 12, 13

1914.

Albion Park A., H., and I. Association	M. A. Brown	Jan. 14, 15
Kiama A. Association	G. A. Somerville	,, 23, 24, 26
Guyra P., A., and H. Society	P. N. Stevenson	Feb. 17, 18, 19
Gunning P., H., and I. Society	J. R. Turner	,, 18, 19
Dapto A. and H. Society	J. H. Lindsay	,, 24, 25
Inverell P. and A. Association	J. McIlveen	,, 25, 26, 27
Uralla A. Association	H. W. Vincent	Mar. 3, 4, 5
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 3, 4, 5
Central New England P. & A. Association (Glen Innes)	George A. Priest	,, 10, 11, 12
Coramba District P., A., and H. Society	H. E. Hindmarsh	,, 11, 12
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 11, 12, 13
Armidale and New England P., A., and H. Assoc'n.	A. McArthur	,, 17, 18, 19, 20
Camden A., H., and I. Society	C. A. Thompson	,, 18, 19, 20
Goulburn A., P., and H. Society	G. G. Harris	,, 19, 20, 21
Crookwell A., H., and P. Society	H. P. Levy	,, 26, 27
Cooma P. and H. Association	C. J. Walmsley	April 1, 2
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins	,, 1, 2, 3
Royal Agricultural Society (Sydney)	H. M. Somer	,, 7-15
Bathurst A., H., and P. Association	J. Bain	,, 22, 23, 24
Tamworth P. and A. Association	J. R. Wood	,, 28, 29, 30
Orange A. and P. Association	W. J. I. Nancarrow	,, 29, 30 May 1
Northern Agricultural Association (Singleton)	E. J. Dann	,, 29, 30, May 1
Hawkesbury District A. Association (Windsor)	H. S. Johnston	May 7, 8, 9

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Agricultural Gazette of New South Wales.

The Maggot-Fly Pest in Sheep.

H. S. MAJOR, Assistant to Sheep and Wool Expert.

Introduction.

THE damage wrought by the ravages of this pest among our flocks has been very great during the last few years, but the trouble is increasing with such alarming strides that it behoves all pastoralists and the different State Governments to co-operate in an energetic endeavour to find some means of alleviating, if not altogether eradicating, the evil. The pest has long been a menace to the sheep and wool industry, particularly in Queensland; and quite recently the pastoralists of that State have petitioned the Government to take steps towards the discovery of some means of combating the blow-fly among sheep.

The pest is directly responsible for the loss of millions of sheep annually throughout Australia; and as most of these are breeding ewes, the natural increase is also retarded. In addition, there are many millions of sheep which have survived milder attacks of the flies but which return poor quality and light fleeces, so that the annual wool production is materially affected.

The Sheep Maggot Flies.

Entomologists distinguish between four kinds of flies which blow sheep. There are two kinds of common blow-flies, viz., *Calliphora villosa* and *Calliphora oceania*. They are both of a brown colour, but differ chiefly in size; the latter adult being about two-thirds ($\frac{2}{3}$) the size of the former.

Of the more uncommon flies there are the *Calliphora rufifacies*, or Metallic Blue blow-fly, and the slightly smaller *Lucilia sericata*, or Metallic Blue Bottle blow-fly. The larvæ found on the sheep are generally white, but sometimes a brown hairy maggot is seen. This is somewhat like the skin weevil, and appears more destructive than the white maggot.

The full-grown maggots are about a half to five-eighths of an inch in length and about one-eighth of an inch in diameter.

Reasons for the Increase of the Pest.

The sheep maggot-fly is not altogether a new pest, and the reasons for its increase and more damaging effects during recent years are purely speculative. The few lean years which culminated in the disastrous general drought of 1902 were, no doubt, responsible for the breeding of billions of these flies. In 1891 Australasia possessed 125 millions of sheep; New South Wales alone carrying 62 millions. At the end of 1902, Australasia possessed only 74 millions, of which number 26½ millions were in New South Wales. Fifteen

millions alone died in this State, chiefly from starvation, between 1901 and the end of 1902. At the time of the drought, the general poverty of the sheep rendered them more liable to attack by the flies, and the deaths of many were accelerated by this cause. Thus the millions of carcases of sheep (apart from other stock and native fauna) which, in many cases, were left to rot and be devoured by maggots, on Australian soil, furnished natural intermediate hosts, the like of which are necessary links in the life cycle of these flies. It is more than probable that many of those flies, propagated through the medium of dead sheep, inherited, in a more pronounced degree, the natural instincts of their progenitors to attack and infest the posterior parts of the living sheep.

Just after the drought referred to (at which time the writer was serving an apprenticeship in a woolsorting and scouring works) truck loads of dead wool, with skin pieces and bones attached, were consigned by various owners in the country to the cities for treatment. From the appearance of the discoloured and matted dead wool, to which still adhered the vacated chrysalis shells of the flies, it was evident that probably some 10,000 pupæ per dead sheep had passed to the winged stage and renewed life as blow-flies.

It is noticeable that the sheep most subject to fly attacks are the wrinkly-skinned Merinos, or the Merinos in hot districts which carry black-tipped fleeces, which is nearly always an indication of excessive yolk secretion. Between 1880 and 1890, many American wrinkly Vermonts (Merinos) were imported to Australia, chiefly to this State. Their blood was distributed amongst many flocks of other States, and the fashion for a while was all for extreme wrinkly types. At the time of the drought, about 75 per cent. of our Merino flocks were of this type, many being thus produced without the introduction of Vermont blood. Apart from the various other indifferent qualities of wrinkly Merinos, the fact that they were so liable to fly attack was one cause of their losing favour with breeders; and the fashion for wrinkles may have been to some degree instrumental in further developing the ravages of the pest.

Then, again, the great improvements made in recent years as regards weight of fleece and extent of wool covering have, no doubt, been detrimental to the sheep in other directions. The modern Merino is far different from its Spanish ancestor. Our present-day types are woolled to the toes, and the wool grows very densely around the parts in the immediate vicinity of the tail. On the tail stump itself the wool also grows comparatively long, and very thick, and here, as in other parts, the wool-growing surface is sometimes increased by skin wrinkles. There may be something in the general custom of docking the tails so short, and the few trials of leaving the stumps longer have failed to disclose any advantage. Nature evidently meant those parts to be comparatively free from wool; but instead of that, the modern abnormal developments in many cases almost block the posterior orifice, with the result that the wool harbours the filth, which afterwards becomes wetted with urine (in the case of the ewe), so that conditions favourable to the flies present themselves.

Conditions most favourable to the activity of the Flies.

As flies generally blow sheep in the immediate vicinity of the tail, it can safely be deduced that the odour of the excreta and urine, which clings to, and wets, the adjacent wool, attracts the flies, as would any other disagreeable matter. In the sheep there is something more. Wool contains a great quantity of a natural thick oil, called yolk (about 40 per cent. in the Merino). This, when wetted with rain, gives off a peculiar, though not disagreeable, odour, and this odour is more pronounced when wetted with urine. This fact may account for the excessively yolky-woolled sheep being more subject to attack than bright, light-conditioned woolled sheep. It is a physiological impossibility for wrinkly Merinos to produce fleeces carrying a small or ordinary amount of yolk; hence, the wrinkly types are more often the victims. Merino sheep are narrow behind; their action is close, and their hocks, in many instances, brush as they walk. This aggravates the cause. On the other hand, such sheep as South Downs are not so likely to get blown, as their wool is short, and carries very little yolk, and their hind legs are set well apart. The pest is more directly associated with the hot districts, but not necessarily the very dry climates of Australia. In Central Queensland, on both sides of the Tropic of Capricorn, which cuts the coastline at Rockhampton, the pest is probably worse than in any other part of Australia. (Rabbits are unknown in these parts). About the Beak Downs District—the home of the best flocks—midway along the Rockhampton-Longreach line—the rain falls chiefly in the months of January, February, and March, and the grass then grows wonderfully. Three or four inches of rain may fall in the early hours of the morning, and the afternoon of the same day may register 100 degrees in the shade. The atmosphere is pungent with rank moisture. It is then that the flies are most active. Saddle cloths taken from sweating horses are immediately fly-blown. The long grass in these good seasons is kept wet by rain, or heavy night dews, and the sheep are in a constant state of damp about the under parts and crutch. When the air becomes cooler, and the sky is overcast, the flies are less active, and then may be seen in thousands walking lazily about the foliage of the scrub and small trees. The fly is also very troublesome in West Queensland, western New South Wales, Riverina, South Australia, West Australia, and the north-west of Victoria, but it does little damage in New Zealand, Tasmania, and the cold, elevated parts of New South Wales.

In nearly all these cold districts the Merinos are being supplanted by British breeds and cross-breds, so that we seldom hear of cross-breds being fly-blown. The few bred in the hot districts do not seem so subject to attack as the Merinos. This may be partly due to the cross-breds having comparatively little yolk in their wool and the wool being less densely packed around their hind-quarters.

It must not be thought that only ewes about to lamb or after lambing are attacked by the sheep maggot-flies. Weaners of both sexes are particularly subject, but rams and grown wethers are not so frequently blown,

probably because they urinate mid-ventrally, and the smell of any excreta present is not accentuated by the additional admixture with urine as in the case of the ewes.

Certain pastures and herbages have more laxative properties than others, and some may tend to make sheep "scour"; on the other hand, an abundance of grass in the dry state has a tendency to produce impaction. Merinos in the saltbush country, as in parts of South Australia, are not so much troubled with flies.

Some Extraordinary Cases.

It must not be absolutely asserted that the fly always selects the one spot for the deposit of its ova or larvæ. The writer has seen odd sheep blown on the back for no apparent reason, and also on the neck, in this case generally between two skin folds, and on the black-tipped yolky wool. In this latter case it is hard to say for certain whether the attack is deliberate, as on the contrary a fly may have become temporarily imprisoned when the sheep lifted its neck, and in its endeavours to free itself, it may have involuntarily ejected some larvæ. It is a significant fact that the larvæ do not absolutely require excreta for their support and development on the sheep. The yolk itself, if in great quantities, seems to supply the necessary nourishment for their existence.

The sores on rams' heads are frequently blown, but the larvæ do not remain long on the raw patches caused by rams' heads coming into contact during rival conflicts. The minute larvæ find their way between the horn and the wool, a crevice which affords excellent harbour, and then they gain access to the interior of the horns by crawling up the small space where the base of the horn laps on the bony protuberances of the skull. Once inside the horns they make their way along the sinuses afforded by the spongy bone tissue which supplied the blood and nourishment necessary for the horns' growth. As they develop they set up a kind of mortification in the horns, which sometimes crack and eject a dark, foul-smelling matter. A ram so affected will leave the flock, seek shade, and die in a few days in an emaciated condition, and from symptoms which suggest a form of blood poisoning. In Queensland hundreds of flock rams are lost in this manner. This complaint must not be confused with the "Œstridæ," or sheep bot-flies, which deposit larvæ on the sheep's nostrils. These very minute larvæ gain access to the olfactory mucous membranes and develop in the sinuses of the skull, which are separated from the brain cavity. Flock rams intended for Queensland might profitably be dehorned as lambs.

There are also instances of sheep becoming blown on all parts of their bodies in consequence of having become bogged shortly before, and having their fleeces fouled by black mud, or silt and decayed vegetable matter washed down by the flooded creeks.

Young lambs are sometimes blown on the tops of their heads. This may seem very improbable, but some lambs approach the udders of their mothers from between the back legs, instead of at the flanks. In so doing, their heads are sometimes fouled with excreta.

The Maggot Fly's "Modus Operandi."

In the case of bot flies, the horse and sheep seem to instinctively anticipate and fear their onslaughts, not that these flies signify their attack by noise, but because they always approach from the front. The sheep maggot-fly "buzzes," but attacks from the rear, and the damage is done while its victim is peacefully feeding. The dense wool of a sheep has not the same power as the short stiff hairs which cover the skin of many animals, of conveying to the tactile corpuscles of the skin the external contact with foreign bodies, consequently a maggot-fly may alight and deposit its passive ova, or active larvæ, on any part of the sheep it may select, other than bare skin, without the sheep being aware of the fact. A horse or cow can feel the smallest insect on its coat; a sheep cannot. It is not until these larvæ develop that the sheep feels their movements against its skin, or against the more delicate mucous membrane of its posterior passages. The maggots grow rapidly, and whilst some move about in the wet wool and excreta attached, others pay attention to the skin and eat into the flesh, the brown maggot being more harmful in this respect. The sheep by this time, perhaps a week from the first attack, is much distressed, and will not graze. Fresh larvæ are continually being deposited, and the sheep begins to know by the "buzzing" around that many other flies are endeavouring to carry into effect their natural desires. The dejected animal separates from the flock and seeks the shade of a tree or stump, where it stamps its feet, wags its tail increasingly, and frequently turns its head to bite over the seat of irritation Here it stands, becoming more and more emaciated, until it drops from exhaustion. Prior to the last act of this tragedy, the vigilant crows most likely will have dealt their "knock-out" blow in their usual manner by picking out the sheep's eyes. Whilst the sheep is still on its feet, the skin and flesh under the affected parts are almost black, and local mortification sometimes sets in. In addition, the maggots frequently pass into the posterior passages. The wool of the blown part separates from the skin and hangs down over the sheep's hocks in a wet, stinking, and discoloured mass. Even before death, the wool growing on the healthy skin will almost pluck out, so feverish has the sheep become. After death the carcase quickly decomposes. Skins taken off very badly blown sheep, the moment they die, will frequently go bad. The appearance of the flesh suggests the necessity for great care in the handling of the carcases.

How to Combat the Evil.

In former times the boundary rider carried his crutching outfit in a saddle bag, and he would catch and treat in the paddock such odd sheep as he saw were affected. The pest cannot, however, be coped with in that manner, as thousands of sheep are attacked, and some thoroughly systematic action is necessary. The difficulty of bringing affected sheep to the yards, or sheds, for treatment will be readily understood on account of the weak condition of the sheep and their inability to travel. Preventive measures are of much

greater importance than any cures. Dozens of alleged cures have been tried, but, so far, little success has been achieved.

Before discussing the best means of prevention, a brief description of the habits and physiological characteristics of the maggot will furnish some basis on which to work. The maggot is the feeding stage before assuming the chrysalis, or pupa, form, after which comes the winged adult fly. These maggots live in filth. They wriggle away from the sun and light, and work best in darkness, and when deposited on the exterior of the fleece they penetrate to the skin. They devour foul matter which might by gradual decay become a menace to public health and stock, and foul the soil, pastures, and water. They are, perhaps, more necessary than they are harmful; but they are the direct cause of making the sheep necessary hosts for their maggots' existence, so that we must first wage war against the fly, and endeavour to prevent its blowing the sheep. This is a very difficult problem. The destruction of maggots is also more difficult than it appears. The common maggot is furnished with a very delicate skin structure, which is capable of great absorbing powers, and which is also supplied with a peculiar function of ejecting from its surface a pale, thin fluid. The functions of this fluid may be—

(1) To moisten hard matter and render it more soluble, so that the nutritive elements are readily absorbed by the skin. This is one means of the maggot's power of extracting nourishment, somewhat similar to the manner in which a frog absorbs into its cutaneous circulation some of the oxygen contained in the surrounding water, and so respires.

(2) To facilitate the maggot's escape from local surroundings not to its liking.

(3) To nullify the effect of certain foreign bodies and acids with which its delicate skin must come into contact, and which would easily kill other creatures.

The common earthworm also possesses somewhat similar properties, best observed in the very large varieties found in such districts as Gippsland, Victoria.

The maggot's wriggling action is necessary for its existence, as it keeps the surrounding matter in constant motion, thereby bringing its body and small mouth into more direct contact with all particles.

Suggested Specifics.

From the above-mentioned facts, the non-effects of certain specifics on the maggots will be more easily understood. It is marvellous what strong solutions the creatures can resist. There are many preparations which will, with difficulty, dislodge the maggots, but will not absolutely kill them. For instance, in treating rams' heads, raw Stockholm tar (applied to the butts of the horns) will dislodge the maggots, but as they fall off and reach the ground and dust, most of them crawl away and survive. Kerosene, a very penetrating fluid, seems to have a similar effect, if the maggots can quickly get away after immersion.

Apart from the discovery of some specific (probably a fluid) which will dislodge *and also kill* the maggots, such a preparation is wanted as will actually (perhaps by its very pungent properties) prevent the fly from lodging on the sheep's rump, and also one which will prevent the development of any ova or larvæ possibly deposited. As the part attacked generally is the crutch and near the tail, the preparation need only be applied there. Although the wool about these parts is very much inferior to other portions of the fleece, yet we require, if possible, something that will not permanently stain or injure the wool. Again, the effect of any fluid or paste on the sheep's skin must be considered, and in addition, a strong poison would hardly be safe, as sheep will frequently bite the skin and wool over or near the seat of irritation.

Perhaps the most difficult task would be to find some such specific which retains its properties and resists for some time the tendency of rain to wash it from the wool. Last, but not least, the specific must be cheap, and its method of application rapid.

Some "Remedies" and Preventive Measures for the Present.

Among the various "remedies" undergoing trial by pastoralists and others are solutions of the many dips at present on the market. There are also some specifics specially manufactured to combat the sheep maggot-fly pest. Just now the New South Wales Department of Agriculture is making a thorough trial of a certain fluid at the Nyngan Demonstration Farm, where the flies this lambing season are very troublesome.

What can be done by constant attention and the treatment every few days of a few sheep is absolutely impracticable on a big estate where large flocks are scattered over extensive tracts of country. In the meantime a few suggestions of preventive measures may be of interest to sheep breeders, and help them to deal with the trouble with some degree of success until such a time (it is hoped, soon) when a reliable remedy is discovered.

Shearing and Crutching.

In addition to the general shearing season in the spring, all sheep, more especially breeding ewes, should be well crutched, by machines for preference, about six months later, say in the month of March, which will be from six weeks to two months before the general lambing season. Briefly, "crutching" means the shearing away of the wool from the crutch and immediate vicinity of the tail, whereby a much freer passage of the excreta is permitted, and from a point of view of cleanliness the timely operation is obviously of very great benefit to ewes at the subsequent lambing time. After both the shearing and crutching operations, all sheep should be sprayed about the crutch with some of the usual solutions. The branding race can be used for the purpose of holding the sheep. Mr. Linden, flock master at the Wagga Experiment Farm, speaks highly of a solution of 1 in 45 of a well-known dip sprayed on the ewes with the ordinary fire-cart apparatus. He treats small flocks of ewes three or four days before they are due to lamb. The extensive

mustering operations on big stations would not permit of this treatment so close to lambing.

Some Queensland Methods.

During my experience in Queensland I observed that some stations shear in the autumn in the hope of making the general shearing serve a double purpose and thus save the extra work of after-crutching. On such places, shearing commences about March, and the ewes, which have previously been mated, begin to lamb about six weeks or two months after shearing finishes. By the following January the sheep carry about nine months' wool and the maggot-fly is then found to be very bad. In addition to their shearing in March, they should systematically crutch all sheep about October, when they have the flocks at the yards for the purpose of drafting off the lambs because of weaning time.

Crutching is looked upon by many as being unnecessary and a costly undertaking, but its many advantages are overlooked. The cost is approximately 5s. per 100 sheep and "found," and about ½ lb. of wool per sheep is obtained.

Dipping as a Means of Prevention.

Whilst dipping "off shears" assures for the rest of the season a vigorous growth of wool by providing a healthy active skin, and prevents the infestation of ticks and lice, it has so far not allayed blow-fly attacks in the hot districts, which are generally pretty free from sheep ticks, and where a few sheep-owners dip for other reasons. From the experiments conducted by the Clarence Board of Agriculture in Tasmania in 1909, concerning the effect of arsenical dips on ticks, it was shown that a proper immersion was sufficient to kill all live ticks, and that when the pupæ attached to the wool hatched out the arsenic retained by the wool was sufficient to kill them or cause them to leave their host. The experiments also claimed to show that a dipped sheep would resist tick infestation when it came into contact with undipped and vermin-infested sheep. The maggot is a totally different trouble to contend against. The small amount of arsenic or other chemical residue of dip left in the wool would be nullified by the filthy state of the particular locality in which the maggots thrive. It is doubtful if the ordinary strength of the dips would prove effective, and any stronger solutions of them would no doubt injure the wool fibre throughout the whole fleece by the total immersion. Moreover, the seat of the trouble is usually local, so that we do not require to subject the whole sheep to the application of what must needs be a rather strong specific.

Treatment of Fly-blown Sheep.

Crutching should, as before stated, be employed as a preventive measure, but it is also the first essential in the successful treatment of affected sheep. With hundreds of blown sheep in a flock (even without the likelihood of long grass, excessive heat, &c.), the task of getting them to the yards is very laborious. When time is very precious, a good plan is to drive the mob for some little time and cut off the tail end, which will contain nearly all the sick sheep. Take these to the nearest yard or woolshed for preference,

crutch them thoroughly and give each one a hip bath by partly immersing it in a trough containing one of the many solutions available. After treatment, the worst sheep should be sent to a "hospital" paddock near by, where a man can keep them under constant observation. All wool containing maggots should be soaked in a tank containing some fluid which will kill them. A somewhat similar method of treatment was adopted on a certain station in Queensland, and though, in the weaners alone, they lost 1,700 out of 10,000 in two months, very many more deaths would have occurred had the sheep been neglected. The season 1907–8 was a particularly good one, and to "push" sheep 2 miles a day through the long grass and in the heat, was considered good under the adverse conditions then prevailing.

The Burning of Dead Sheep.

The adoption of a rigid system on all stations of properly incinerating all dead sheep and other stock must have a good effect in checking rapid increase of the flies. A small fire is no good, as many maggots will crawl out through the smoke on the far side and escape before the fire properly bursts into flame. The fire should be well lighted all round. The writer has scraped dozens of fully developed maggots from about 2 inches under the ground fringing the ashes of a fire, where a day or two before he had completely and at once burnt a sheep which had died in the yards, and which had been carried out to a spot selected for its disposal. One could not but marvel at their escape.

Here, again, the previously mentioned discharge of a fluid from the skin had protected many maggots individually from the excessive heat, and collectively the fluid kept moist the soil and dust covering them, and so protected them all from the great heat of the adjacent fire which burnt almost to brick dust the ground over which the carcase lay.

On many stations in the dry out-back areas, wood is very scarce (being even difficult enough to obtain for household requirements), and the burning of carcases is well-nigh impossible. Burial would be effective in such cases. In other places where there is plenty of wood, this duty is absolutely neglected even if the carcase had been skinned. Some prefer to leave the unskinned sheep to rot, so that the "dead" wool may be gathered up afterwards. It is rather tempting to leave for after-gathering, the wool of a sheep which had perhaps died in full fleece, and had not been discovered for possibly a week. It is, however, hardly worth the trouble, in the face of the above arguments, to leave unburnt, and afterwards to gather up, the wool, often only an inch long, and of necessity of little value, on account of its being only recently shorn and rendered very dirty by being for some months subjected to rain, mud, dust, and maggots.

At the time when the maggots have completed their task of devouring a carcase, it is also opportune for their "hibernating" stage in the dead wool or adjacent soil under which they bury themselves, and those that are not located by birds, are duly hatched out as adult maggot flies by the never-failing Australian sun.

New South Wales Wool in Great Britain.

Summary of Reports from the Agent-General.

J. WRENFORD MATHEWS.

A better object-lesson of the extent to which this State benefits from a generous season, could hardly have been seen anywhere than that which was afforded by the products, especially the wool exhibited in the different district trophies at the Royal Show of 1912. Attracted by the excellence of that display, a number of gentlemen waited on the Minister of Agriculture, the Hon. J. L. Treflé, with a view to having the least perishable portion of the exhibit forwarded to the United Kingdom for exhibition there. The Minister having given his consent, arrangements were made by the Department of Agriculture for a representative shipment, and the Agent-General was asked to arrange for the displays in Great Britain.

The consignment included a comprehensive display of wheat and other cereals, a choice variety of dried and bottled fruits, and a valuable collection of wool in both the greasy and scoured states. Fleeces representative of different types of sheep, and of the various classes of wool produced by the several districts, were selected for the purpose.

Whilst the other products have received their share of attention, and have been shown in a number of centres, the reports of the Agent-General indicate that particular prominence has been given to the display of wool. It has been staged in most of the important wool manufacturing centres, both in England and Scotland, and as the Agent-General in his last letter stated his intention of sending it to other prominent places, it is quite possible that eventually it will be seen on the Continent.

Wherever shown the interest of those associated with wool and its manufacture has been most marked. The various specimens are regarded as well up to the standard of our wool product. The majority of the fleeces were grown by comparatively small breeders, and the Minister has directed that a resumé of the Agent-General's reports be published for the information of these growers and of wool producers generally.

Writing on the 13th September, 1912, the Agent-General reports that the fleeces were placed on exhibition in the Textile Branch of the Bradford Technical College. He says:—

> A great deal of publicity has been given by the Yorkshire press to the exhibit, which is described as the finest of its kind New South Wales has presented to the public, and the representatives of the manufacturing trade are paying a good amount of attention to the display.

Further advice dated the 1st November, 1912, stated:—

> The exhibit of New South Wales wool, having been removed from Bradford, was officially opened at Huddersfield on Monday, the 28th October, by the Mayor of that city, in the presence of an influential gathering. The exhibit is displayed in the main hall of the Textile Institute, and the opening was arranged to coincide with a lecture on the woollen industry, in the same hall, at which about 150 persons interested in the industry attended. The commercial officer of this Department attended and drew attention to the exhibit, and on the following day delivered a lecture on the wools of the State to the students of the College.

With regard to the exhibit at Halifax, the Agent-General stated on the 6th December :—

The special collection of New South Wales wools was opened for display at the Halifax Municipal College on the 2nd instant. The woollen manufacturers of the district were represented by a large attendance of gentlemen, who displayed great interest in the exhibit. The Press has again given a lot of publicity to the display, appreciation of the course adopted in sending the wools to this country is fully expressed, and the enterprise of the State commented upon.

A further communication on the 17th January, 1913, contains additional information :—

The special display of New South Wales wool was opened at the Leeds University, on the 15th instant, before a large attendance of the manufacturing interests of Yorkshire and the students of the textile industries' branch of the University. As in other centres of the West Riding, great interest has been displayed and a considerable amount of publicity given to the exhibit, the full value of which is realised by the users and other interested persons in Yorkshire.

Additional advice came to hand of the exhibit being taken to Scotland early in February :—

The special exhibit of New South Wales wool is now on exhibition at Hawick, Scotland, a large hosiery and tweed manufacturing centre, in which a great quantity of Australian wool is used, more particularly in the manufacture of underwear. Exceptional interest is being displayed by manufacturers and others, and at a lecture delivered by the commercial officer quite 200 persons solely interested in the manufacturing industry were present, and marked appreciation was expressed at the action of the Government in placing such a valuable variety of material before them. This display has done, and is doing, a great deal of good, and I propose to arrange for exhibitions at several important centres immediately following that of Hawick.

The last communication was received on the 21st February, 1913, in which the Agent-General states that the exhibit was then at Galashiels, an important manufacturing centre in the south of Scotland :—

The special exhibit of New South Wales wools was opened at the South of Scotland Technical College, Galashiels, on the 19th instant, and will remain for one week. At the opening there was a large attendance of representatives of manufacturers, who displayed a keen interest in the exhibit. The commercial officer delivered an illustrated lecture in the evening, and at the close it was requested that the appreciation of the manufacturers of the south of Scotland should be conveyed to the growers of the wool and the Government of the State for the preparation and display of the exhibit.

The following comment from the English correspondent of the Sydney *Daily Telegraph* is of interest :—

Of the Merino classes little comment is necessary, for they are known throughout the manufacturing cities in this country a great deal better than by a majority of the people themselves in New South Wales. In the cross-bred section great interest was aroused in a Corriedale fleece. South of Scotland manufacturers regard this medium fine cross-bred type as being the nearest approach to the home Cheviot they have handled, and particularly suitable for their requirements in the manufacture of South of Scotland tweeds. The fibre, while lacking some of the bloom of the Cheviot, is finer than the home-grown wool, and has a fine body and strength, while the length of staple is admirable for this particular trade.

It is safe to say that pastoral New South Wales has never before had such an amount of commercial publicity attracted towards it, and while this was the primary object of the displays, too much importance cannot be given to the side of general publicity. The wealth of the State, from the pastoral point of view, has been brought before the people of this country in a practical fashion, and the result should be satisfactory, both to the State as a whole and to the pastoral interests in particular.

The Fleeces Exhibited.

Altogether sixty-five fleeces, varying in class, quality, and texture, and bred from types representing all grades from the coarse to the superfine

strains of Merino, were selected. Included were both combing and clothing sorts, from districts fairly representative of those divisions of the State where such classes are grown, and in addition there was also an assortment of various longwool cross-bred fleeces, the result of the experiments being conducted at the various Experiment Farms. Considerable differences in colour, style, quality, character and texture marked these. A fleece of the Corriedale breed was also included. The breed is somewhat new to the State, but it is being bred in the Inverell district.

The value of the exhibit was greatly enhanced by the inclusion of a considerable quantity of very high grade Merino scoured wool. These samples had been well prepared, and were from the same grades as a number of the Merino fleeces shown in the greasy state. Seen side by side with the greasy samples, they made an elegant display, and showed to perfection their very attractive superfine qualities.

Full particulars as to the description of the wool, age and sex of the sheep, districts and breeders, were given on cards attached to the fleeces.

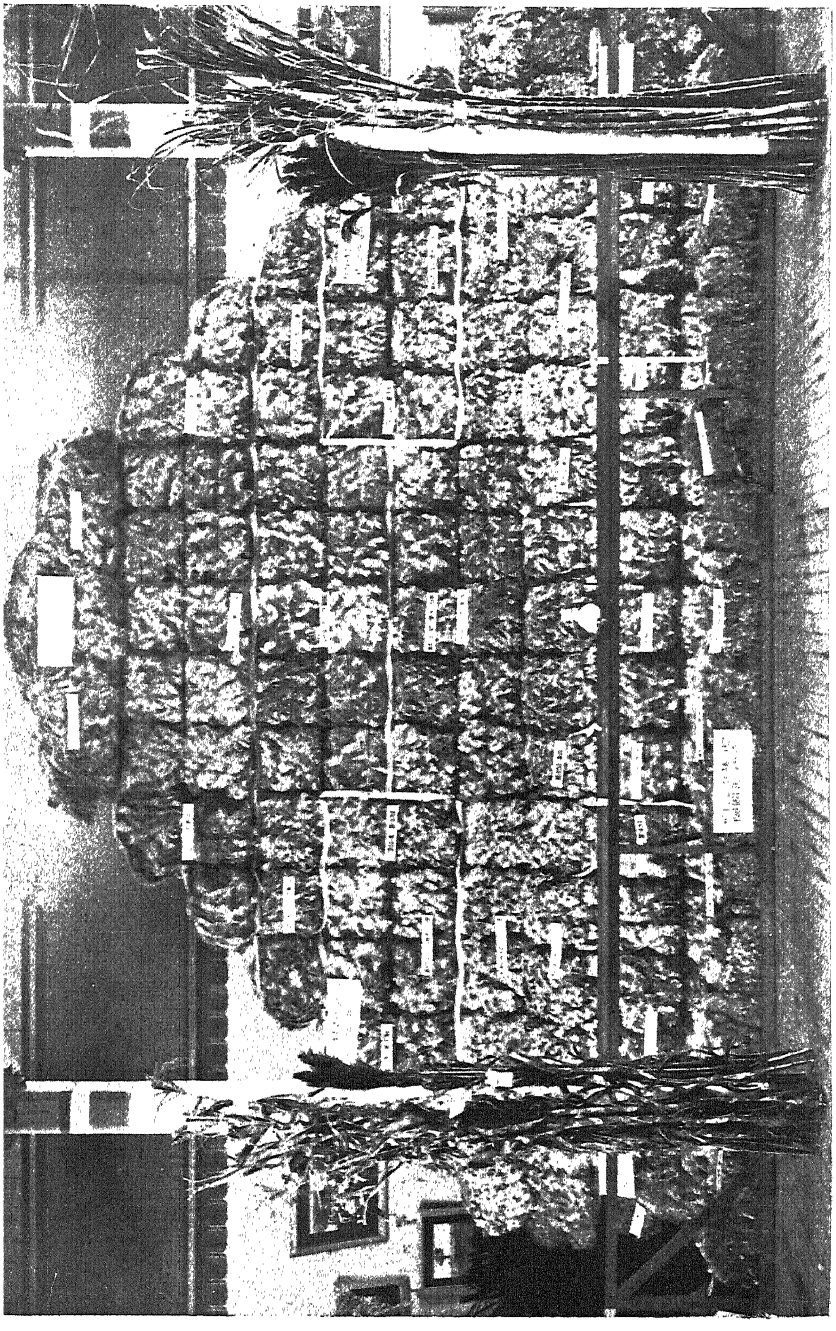
The co-operation of several farmers and station-owners who contributed to the exhibit by gifts of fleeces was an important factor in the success of the venture. Indeed, without their support the collection would not have been so representative and valuable as it was.

Breeders should Co-operate.

The various district exhibits at the Royal Show afforded an excellent means for collecting the fleeces, and enabled breeders to show what their different districts are capable of producing. As this consignment may lead to others being forwarded in the future, it is suggested that breeders should co-operate by selecting at shearing time, and contributing to different district exhibits the best fleeces that they can produce, no matter what may be the type or breed.

The Preservation of the Fleece.

It would be well to have fleeces which are intended for exhibition carefully preserved, in order that, when placed on view, they may be seen to the best advantage. Between the time of shearing and opening up for inspection they should be wrapped singly in oil-proof sheets, and placed in a case away from heat and dust. Unusual care is also necessary in the shearing of the sheep where fleeces are intended for exhibition. The sheep should be shorn on an absolutely clean board, and every effort made to keep the various staples which constitute the fleece as a whole as intact as possible. During shearing the staples should be carefully drawn together, and retained in their natural upright position. On no account should the fleece be thrown out on the table; the oil-sheet should be placed alongside it on the board, and the fleece transferred to it with as little handling as possible. The outside glazed surface of the sheet should be turned to the wool, and the fleece rolled flesh side out. A card giving particulars of the sex, age, class and breed of the sheep, together with the exhibitor's or breeder's name, should be inserted in each packet for general information, as was done in the case of the fleeces recently exhibited in Great Britain.



The Wool Display at the Royal Agricultural Show, 1912, from which the specimens were selected for exhibition in Great Britain.

Notes on Wheats Competing for Prizes at the Royal Agricultural Society's Show.

Easter 1913.

F. B. GUTHRIE.

The money set apart for prizes at the Royal Agricultural Society's Show was increased this year by a substantial amount, and the wheat classes shared liberally in this surplus. The sum alloted to the different wheat sections amounted to £120, as against £83 in 1912.

It was hoped that this addition would result in a considerable increase in the entries, but two factors helped to reduce the number of exhibits. In the first place Easter was unusually early, so that exhibitors had not as much time as usual to prepare; and in the second place there was more delay than usual in the traffic, and many exhibits, though despatched in time, either arrived late or were not received at all.

As a consequence there were only five or six more entries than last year. The quality of the entries was, however, very considerably above that of 1912.

The judges (Messrs. R. W. Harris and G. W. Norris) report that "the appearance of the samples had improved so much, compared with those of last year, that quite a large number could not have been separated had it not been for the aid of the mill. The improvement is regarded as due to the use of modern machinery combined with better farming practice. The most noteworthy feature was that in the open classes the wheats created by the late Wm. Farrer carried off all the prizes.

"In the Red Wheat class Cedar again secured first prize, and also won the champion award for the best bag of wheat.

"The sample was of exceptional flour-strength, very attractive in appearance, and showed no signs of deterioration. It was superior to any Manitoba wheat that has been imported."

A glance at the figures given in the following lists will show that it is not only in the appearance of the samples, but in their milling qualities that a very considerable advance has been made. In the first place, the bushel-weights are exceptionally high. Last year the highest weight was 67 lb. per bushel, the champion wheat scaling 66 lb. This Easter the champion wheat weighed 68½ lb. and there was a very large number between 67 and 68 lb.

The following table shows to how great an extent the bushel-weights are in advance of previous years both in the Strong White and in the Soft White classes.

TABLE showing the average bushel-weights of strong and weak flours since 1905 :—

	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.
Strong White ...	63	63¾	62½	64½	64¾	64½	64½	65	67
Soft White ...	64	64½	66	65	65¼	64	63½	64	65¼

This increased bushel-weight has been accompanied by an improvement in the gluten-content and flour-strength. This is shown in the following table which is reprinted from the similar report in 1912, the figures for 1913 having been added.

AVERAGE Gluten-content and Water-absorbing power of Wheats (Strong White and Soft White) milled at the Royal Agricultural Society's Shows from 1905 to 1913.

Year.	Gluten.		Flour-strength (water absorption).	
	Strong White.	Soft White.	Strong White.	Soft White.
1905	10·0	9·7	46·6	45·2
1906	11·0	9·8	48·5	45·7
1907	9·3	8·3	48 4	45·4
1908	12·2	10·2	52·5	46·4
1909	11·9	8·6	53·5	49·2
1910	13·8	12 1	50·0	47·8
1911	12·5	11·0	53 4	47·0
1912	13·4	10·6	52·7	45·2
1913	15·2	11·7	53·1	46·9

It is fair to assume that the wheats exhibited represent fairly well the better class of wheat grown, and that this represents an improvement which is maintained throughout the State. This satisfactory conclusion is further borne out by the f.a.q. sample which shows a much higher bushel-weight this year than last—62¼ lb. as against 61½—and which yields a stronger flour.

The judging was carried out as in previous years. The bushel-weight of all the samples was taken, and the results are given in the first of the tables which follow.

After careful inspection to eliminate the inferior exhibits, those which were considered eligible for prizes were milled on the small model mill of the Department of Agriculture, and the prizes were finally awarded in accordance with their actual behaviour in the mill, marks being assigned to the different milling characteristics. The result of these tests will be found in the table headed "Results of Milling Tests," in which the figures within brackets give the actual milling results, the other figures giving the marks obtained.

The judges were Messrs. R. W. Harris, head miller, Gillespie Bros., and G. W. Norris, Chemist's Branch, Department of Agriculture; the milling of the samples being carried out by Mr. Norris.

The champion prize for the best bag of wheat exhibited went this year to Mr. W. H. Scholz, of Gilgandra, for a sample of Cedar, which also took first prize in its class. This variety also won the champion prize in 1912, but

it is satisfactory to note that the yield per acre was this year fairly high (24 bushels), whereas last year the winner only obtained a 9-bushel crop. As the rainfall was only 7 inches during the growth of the crop exhibited this year, this result must be regarded as highly satisfactory.

In the Macaroni class the same grower has this year beaten Mr. Clark, the South Australian exhibitor, who has carried off the prize on more than one occasion, and who takes the second prize this year.

In the Hard Red class, in which the champion was exhibited, there was only one exhibit of Manitoba: its place in this class is being gradually taken by Cedar, which contains Manitoba blood, and appears more suited to our conditions.

In the Strong White class the first prize went to a fine sample of Bobs, grown by Mr. Smith Pollock, of Quirindi, Mr. Tonkin coming second with a sample of Comeback, grown at Delungra.

There were two special prizes in this class—one for the best bag of "New South Wales Strong White," and one for the best bag of Comeback. In the first case there were only two entries, and as the prize was a substantial one (£10 10s., to be increased to £13 13s. if ten exhibits entered) the poor response must have been due to exhibitors not having realised that a special entry was needed. In both these cases the prize went to a sample of Comeback, grown by Mr. W. Tonkin, of Delungra.

A new class was introduced this year, that of Medium-strong Flour Wheats to give a chance to wheats which are fairly strong flour varieties, but cannot successfully compete with wheats like Bobs or Comeback. The first and second prize in this class both went to Florence. In the Weak Flour class the varieties Warren and Plover took first and second prizes respectively, the latter yielding 30 bushels to the acre.

It will be seen that every prize, except in the Macaroni class, was taken by a wheat introduced by Farrer, which is an additional triumph for these wheats, and a sufficient reply to the suggestion sometimes made as to the deterioration of these varieties.

WEIGHTS PER BUSHEL.

Catalogue No.	Variety.	Bushel-weight.	Catalogue No.	Variety.	Bushel-weight.
	Class 751 (Macaroni Wheat).				
4534	Indian Runner	65·5	4544	Velvet Don	65·9
	Class 752 (Hard Red).				
4545	Manitoba	64·4	4548	Cedar	66·6
4546	Cedar	68·6	4549	,, ...	66·6
4547	,, ...	68·5			
	Class 753 (N.S.W. Strong White).				
4550	Comeback	66·6	4558	Bobs	67·4
4551	Bobs	67·2	4559	Comeback	67·1
4552	Comeback	67·9	4560	,, ...	67·0
4553	,, ...	68·2	4561	,, ...	67·0
4554	,, ...	66·3	4564	Bobs	66·3
4555	,, ...	65·0	4565	Comeback	67·6
4556	,, ...	67·0	4566	,, ...	66·8
4557	,, ...	67·4			

WEIGHTS PER BUSHEL—*continued.*

Catalogue No.	Variety.	Bushel-weight.	Catalogue. No.	Variety.	Bushel-weight.
	Class 754 (Medium Strong Wheats).				
4575	Marshall's No. 3	65·5	4586	Rymer	65·2
4576	Bunyip	66·0	4587	Florence	67·4
4577	Federation	65 4	4588	,, ...	67·9
4578	Zealand	66·2	4589	Bunyip	65·5
4579	Bunyip	65·7	4590	Bayah	67·0
4580	Federation	64·1	4591	,, ...	67·6
4581	Firbank	64·1	4592	Florence	66·0
4582	Marshall's No. 3	64·2	4593	Rymer	65·7
4583	Federation	65 0	4594	Yandilla King	65·4
4584	Bunyip	65·5	4595	Towri Comeback... ...	67·3
4585	Federation	64 9	4596	Firbank	66·0
	Class 755 (Weak Flour Wheat).				
4597	Petatz's Surprise	66 0	4602	Plover	66·3
4598	Dart's Imperial	66·0	4603	Warren	65·9
4599	Frampton	67·6	4694	,, ...	65·2
4600	Warren	65·9	4605	Steinwedel	63·0
4601	Dart's Imperial	61·2			

RESULTS OF MILLING TESTS.

	Appearance of Grain.	Weight per bushel.	Ease of Milling.	Percentage of Flour.	Colour of Flour.	Percentage of dry Gluten.	Strength.	Total.
Maximum Marks.	10	15	10	10	15	20	20	100
Catalogue No.		**Class 751 (Macaroni).**						
4544	10	[65·9] 15	8	[73.8] 10	12	[11·2] 16	[50·2] 16	87
4543	8	[65·5] 15	6	[71·4] 9	6	[14·1] 18	[55·6] 20	82
		Class 752 (Hard Red).						
4547	10	[68·5] 15	8	[71·7] 10	14	[11·5] 17	[57] 20	94
4549	7	[66·6] 13	8	[70·1] 9	15	[13·7] 18	[57] 20	90
		Class 753 (N.S.W. Strong White).						
4558	10	[67·4] 14	8	[72·6] 10	14	[16·2] 20	[52·8] 18	94
4565	9	[67·6] 14	8	[72·6] 10	14	[13·0] 18	[55·6] 20	93
4559	10	[67·1] 14	8	[68·0] 8	12	[17·3] 20	[52·0] 18	90
4566	8	[66·8] 13	8	[73·8] 10	10	[14·4] 18	[52·2] 18	85
		Class 754 (Medium Strong).						
4588	10	[67·9] 15	8	[71·7] 9	15	[13·7] 18	[47·0] 15	90
4587	6	[67·4] 14	8	[70·6] 9	15	[12·7] 18	[50·6] 17	87
4589	5	[65·5] 12	9	[70·0] 9	12	[12·0] 17	[48·0] 16	80
4590	9	[67·0] 14	9	[72·3] 9	13	[11·7] 17	[45·0] 14	85
4591	8	[67·6] 14	9	[70·9] 9	12	[12·6] 17	[44·6] 14	83
4576	7	[66·0] 13	9	[71·7] 9	13	[10·8] 16	[48·6] 16	83

RESULTS OF MILLING TESTS—*continued.*

	Appearance of Grain.	Weight per bushel.	Ease of Milling.	Percentage of Flour.	Colour of Flour.	Percentage of dry Gluten.	Strength.	Total.
Maximum Marks.	10	15	10	10	15	20	20	100
Catalogue No.		**Class 755 (Weak Flour).**						
4600	9	[65·9] 13	10	[70·6] 9	15	[12·5] 17	[46·6] 15	88
4602	10	[66·3] 13	10	[68·5] 7	15	[11·8] 17	[46·6] 15	87
4599	8	[67·6] 14	10	[71·7] 9	13	[10·9] 16	[47·2] 16	86
4604	7	[65·2] 12	10	[71·3] 9	14	[9·5] 15	[47·4] 16	83

Special Prize for best collection of five Farrer Wheats.

Catalogue No.	Variety.	Seed per acre.	Yield.	Rainfall.	Soil, &c.
4606	Bobs	½ bus.	18½ bus	6 in. during growth.	Red loam.
,,	Comeback	,,	18 ,,		Autumn ploughing.
,,	Federation	,,	20 ,,		,,
,,	Plover	,,	16 ,,		,,
,,	Bunyip	,,	20 ,,		,,
4607	Firbank	40 lb.	25 bus.	No record.	Chocolate soil.
,,	Jade	,,	27 ,,		,,
,,	Bunyip	,,	26 ,,		,,
,,	Federation	,,	29 ,,		Fallow.
,,	Thew	,,	24 ,,		,,
4608	Tarragon	40 lb.	26 bus.	6·5 in. during growth.	Chocolate soil.
,,	Cumberland	,,	24 ,,		,,
,,	Comeback	,,	28 ,,		,,
,,	Bobs	,,	22 ,,		Fallow.
,,	Florence	,,	30 ,,		,,
4609	Bobs	45 lb.	22 bus.	12·45 inches.	Black soil.
,,	Comeback	,,	28 ,,		,,
,,	Florence	,,	26 ,,		Sandy soil.
,,	Federation	,,	33 ,,	10·87 inches.	,,
,,	Cedar	,,	18 ,,		,,
4610	Cedar	48 lb.	18 bus.	7·35 in. during growth.	Sandy loam.
,,	Comeback	45 ,,	25 ,,		Autumn ploughing.
,,	Bayah	45 ,,	21 ,,		,,
,,	Warren	45 ,,	20 ,,		,,
,,	Federation	48 ,,	22·6 ,,		,,
4611	Federation	40 lb.	37 bus.	10 in. about.	Granitic soil.
,,	Comeback	60 ,,	30 ,,		,,
,,	Bunyip	60 ,,	28 ,,		,,
,,	Cleveland	40 ,,	30 ,,		Fallow.
,,	Thew	60 ,,	29 ,,		,,

Special Prize for best collection of five Farrer Wheats—*continued.*

Catalogue No.	Variety.	Seed per acre.	Yield.	Rainfall.	Soil, &c.
4612	Comeback	45 lb.	24 bus.	13·5 in. during growth.	Brown soil.
,,	Bayah	,,	26 ,,		,,
,,	Florence	,,	31 ,,		,,
,,	Plover	,,	30 ,,		Black.
,,	Cedar	,,	33 ,,		Red.
4613	Firbank	52 lb.	21 bus.	12 in. during growth.	Gravelly loam.
,,	Comeback	,,	17 ,,		,,
,,	Warren	,,	22 ,,		,,
,,	Cedar	,,	21 ,,		Red loam.
,,	Bunyip	,,	27 ,,		,,

Special Prize for best collection of five non-Farrer Wheats.

Catalogue No.	Variety.	Seed per acre.	Yield.	Rainfall.	Soil, &c.
4614	Marshall's No. 3... ...	45 lb.	24 bus.	10 87 inches.	Sandy soil.
,,	Hudson's Purple Straw...	,,	32 ,,		,,
,,	Steinwedel	,,	31 ,,		,,
,,	Tuscan	,,	25 ,,	12·54 inches.	Autumn ploughing.
,,	Yandilla King	,,	34 ,,		,,
4615	Marshall's No. 3... ...	44 lb.	21 bus.	7·37 inches during growth.	Sandy loam.
,,	Purple Straw	40 ,,	22 ,,		,,
,,	Viking	45 ,,	18 ,,		Autumn ploughing.
,,	King's Early	60 ,,	21 ,,		,,
,,	Zealand	45 ,,	20 ,,		,,
4616	Marshall's No. 3... ...	45 lb.	32 bus.	13·5 inches during growth.	Black soil.
,,	Manitoba	,,	22 ,,		,,
,,	Zealand	,,	19 ,,		Brown soil.
,,	Gulas Early	,,	35 ,,		Red soil.
,,	Carmichael's Eclipse ...	,,	31 ,,		Autumn ploughing.

SPECIAL PRIZE for best bag of Comeback exhibited.

Catalogue No. 4569 — Butler, Wm.; grown at Gilmore, Tumut Line, on red loam; seed per acre, 90 lb.; yield per acre, 33 bushels; rain during growth, about 12 inches; late winter ploughing (between the 16th and 20th July, 1912).

4570 — Gregory, Geo., sen.; grown at Stone Quarry Farm, Deep Creek, Narrabri; on dark loam; seed, 40 lb. per acre; yield per acre, 14 bushels; rain during growth, 2·5 inches; autumn ploughing.

4571 — Hockey, Alfred J.; grown at Gunningbland; on mixed clay and red loam; seed per acre, 40 lb.; yield per acre, 25 bushels; rain during growth, 30·6 inches; fallow.

4572 — Pyne, Edmund; grown at Euranderee, Mudgee; on red soil; seed per acre, 40 lb.; yield per acre, 25 bushels; rain during growth, about 6 inches; autumn ploughing.

4573 — Roach, J. B.; grown at Gilgandra; on sandy loam; seed per acre, 45 lb.; yield per acre, 24 bushels; no record of rain during growth; autumn ploughing.

Awards.

Class 751—Macaroni.

Catalogue No. 4544. First Prize—Scholz, W. H.; variety, Velvet Don, grown at Gilgandra, on red loam; seed per acre, 30 lb.; yield per acre, 17 bushels; rain during growth, 7 inches; autumn ploughing.

Catalogue No. 4543. Second Prize—Clark, Wm.; variety, Indian Runner; grown at Angle Vale, South Australia; on sandy soil; seed per acre, 60 lb.; yield per acre, 12 bushels; no rain record kept; fallow.

Class 752—Strong Red Wheat.

Catalogue No. 4547. First Prize—Scholz, W. H.; variety, Cedar; grown at Gilgandra; on red loam; seed per acre, 30 lb.; yield per acre, 24 bushels; rain during growth, 7 inches; autumn ploughing.

Catalogue No. 4549. Second Prize—Towri Estate; variety, Cedar; grown at Maryvale; on red loam; seed per acre, 52 lb.; yield per acre, 21 bushels; rain during growth, 12 inches; fallow.

Class 753—N.S.W. Strong White.

Catalogue No. 4558. First Prize—Smith, Pollock; variety, Bobs; grown at Glengarry, *via* Quirindi; on black soil; seed per acre, 45 lb.; yield per acre, 22 bushels; rain during growth, 12·45 inches; fallow.

Catalogue No. 4565. Second Prize—Tonkin, Wm.; variety, Comeback; grown at Little Plain, Delungra; on red soil; seed per acre, 45 lb.; yield per acre, 21 bushels; rain during growth, 13·5 inches; autumn ploughing.

Class 754—Medium Strong Flour Wheat.

Catalogue No. 4588. First Prize—Smith, Pollock; variety, Florence; grown at Glengarry, *via* Quirindi; on sandy loam; seed per acre, 45 lb.; yield per acre, 26 bushels; rain during growth, 12·45 inches; autumn ploughing.

Catalogue No. 4587. Second Prize—Pankhurst, Alfred G.; variety, Florence; grown at Tamworth; on red stony soil; seed per acre, 35 lb.; yield per acre, 25 bushels; rain during growth, 12 inches; autumn ploughing.

Class 755—Weak Flour Wheats.

Catalogue No. 4600. First Prize—Roach, J. B.; variety, Warren; grown at Gilgandra; on sandy loam; seed per acre, 45 lb.; yield per acre, 20 bushels; no rain record; autumn ploughing.

Catalogue No. 4602. Second Prize—Tonkin, Wm.; variety, Plover; grown at Little Plain, Delungra; on heavy black soil; seed per acre, 45 lb.; yield per acre, 30 bushels; rain during growth, 13·5 inches; autumn ploughing.

SPECIAL PRIZE (New South Wales Strong White Wheat.)

Catalogue No. 4568. Tonkin, Wm.; variety, Comeback; grown at Little Plain, Delungra, on brown soil; seed per acre, 45 lb.; yield per acre, 24 bushels; rain during growth, 13·5 inches; autumn ploughing.

SPECIAL PRIZE for best bag Comeback exhibited.

Catalogue No. 4574. Tonkin, Wm.; variety and conditions same as previous entry, No. 4568.

CHAMPION PRIZE for best bag of Wheat exhibited.

Catalogue No. 4547. Scholz, W. H.; variety, Cedar: grown at Gilgandra, on red loam; seed per acre, 30 lb.; yield per acre, 24 bushels; rain during growth, 7 inches; autumn ploughing.

SPECIAL PRIZES FOR FIVE FARRER WHEATS.

First Prize—Smith, Pollock (Quirindi). Catalogue No. 4609.
Second Prize—Roach, J. B. (Gilgandra). Catalogue No. 4610.

SPECIAL PRIZE FOR FIVE NON-FARRER WHEATS.

First Prize—Roach, J. B. (Gilgandra). Catalogue No. 4615.

The Classification of Wheats.

J. T. PRIDHAM, Wheat Experimentalist.

THE different races of wheat have been divided into the following botanical classes :—

Triticum monococcum	or Einkorn.
T. dicoccum	,, Spelt.
T. turgidum	,, Poulard.
T. durum	,, Macaroni.
T. polonicum	,, Polish.
T. compactum	,, Squarehead.
T. vulgare	,, Common Wheat.

Einkorn has a very slender ear with but two rows of grain, like Chevalier barley, and is provided with fine awns; the rachis is brittle and the thin spikelets lie very close together. It is very dwarf in habit, with extremely narrow, abundant foliage like rye grass, and unless sown very early the plants will not form grain. A number of crosses between this wheat and the common varieties have been attempted by the writer without success.

Hunt* says: "It is cultivated to some extent in Europe in poor and rough places unsuited for ordinary wheat. Its grain is only suitable for stock."

Spelt (German *Dinkel or Speltz*) is seldom cultivated in Europe except in the north of Spain, where it is still commonly grown. Both bearded and bald forms of Spelt occur, and the spikelets are always set far apart. Its prominent characteristics are hardiness, constancy in fertility, and power to hold its grain, while the chaff is so strong that it defies the attacks of birds. The brittleness of the ear axis is a drawback, and we have also found it very liable to summer rust, for which reason it has not been employed in crossing to prevent the shaking out of grain in other wheats. The yield is not superior to that of common wheat under ordinary conditions, and the grain is only fit for stock food.

Emmer.—This race is sometimes erroneously called Spelt in America. "The head," Carleton says, "differs essentially from that of Spelt in being flattened, always bearded, and very compact in appearance. The grain is usually harder, more contracted at the sides, and darker in colour." Its drought and rust-resisting qualities, and power of holding its grain tightly, render it useful to employ in crossing with ordinary wheats, and we have had recourse to it for this purpose on several occasions. In cold climates it is said to form a valuable forage plant in addition to giving a good yield of

*The Cereals in America, p. 48.

grain per acre. The grain, however, cannot be separated from the chaff by ordinary harvesting machinery, and the yield does not exceed, so far as our experience goes, that of ordinary wheats.

A species of Emmer—*T. dicoccum dicoccoides*—has been found growing wild in Palestine by Aaronsohn, the Director of the Jewish Agricultural Experiment Station at Haifa. He has found it flourishing in regions ranging from some below sea level to others over 6,000 feet above. Carleton, of America, and Körnicke, of Germany, are using this wheat in crossing to produce hardy varieties which will thrive, it is hoped, in districts of poor soil and severe climate. We have made a few crosses with it, and find that it readily blends with common wheats. Its outstanding defect is the brittleness of the head and straggling habit of the straw: the head breaks up and falls from the stalk before it is dead ripe.

Poulard.—This is also called *Cone, Rivet, or English Wheat*, though not grown in England. Some varieties form a branched head, variously named *Miracle, Mummy, Egyptian, Branched, Eldorado*, and *Hen and Chickens*. The prolific-looking head is misleading, for these varieties are of no particular value. Poulard wheats are grown in the hot, dry regions bordering the Mediterranean. They rather resemble macaroni wheats, but the head is not so flattened, the beards often partially drop off at maturity, and the straw is often stiffer. The grain is generally softer, not presenting the same glassy fracture seen in the grain of macaroni wheats, and has a characteristic humpbacked appearance; the chaff also is thinner and less stiff in the Poulards. The straw grows tall and is often solid except for a kind of pith in the centre. On certain soils the grain becomes as flinty as that of the macaroni wheats in appearance, but is more rounded in shape.

Their flour is sometimes used in French markets for macaroni making, but often in blends of flour for various baking requirements. By itself it does not make satisfactory bread, and on account of this we have preferred to use macaroni varieties when crossing to impart drought resistance to ordinary wheats.

Macaroni wheats, generally called Durums in America, have been largely used in Europe for the manufacture of macaroni. They are better suited than the ordinary wheats for this purpose, on account of their density and the large proportion of gluten they contain. Millers avoid them because of the extra care required in steaming to soften them sufficiently for grinding, and in many varieties the darkness of their flour is objectionable. It has been found by Carleton that Kubanka, although a variety of this class, makes bread of the highest quality and flavour, in addition to having a satisfactory colour. Huguenot is a beardless variety of this class which is becoming well known in the State; it is grown chiefly on the coast for green fodder and silage, but in South Australia it is in demand for hay purposes. For bread-making it is quite unsuitable.

Macaroni wheats grow tall and stool sparsely, while the heads are usually heavily bearded, flat-sided, with hard, closely-set chaff. The colour of the

heads varies from pale yellow to brown or bluish black. They are resistant to drought and rust, but need fairly good soil. The sowings should be heavier than with ordinary wheats to secure a good crop. The straw is nearly solid, and stock are said to be very fond of it. The crop, when not sown too early (when the straw grows too tall and becomes lodged), can be stripped without trouble. In cross-breeding we have used wheats of this class for their drought and rust resisting qualities, but, so far, the crosses have not proved as prolific as ordinary wheats for grain production, even in dry hot districts. Macaroni wheats are much grown in Spain, also in South and Central America, North Africa, and Russia.

Polish, sometimes called *Diamond or Roman Wheat or Giant Rye*. The chaff is abnormally long, loose and open, giving the plant a very distinct appearance. The grain is large, very long, and resembles that of rye in shape, but larger. The straw is tall, and pithy within. Hunt* says: "It rarely gives rise to a fertile cross with common wheat." We have made several crosses with it in previous years but do not find the progeny very prolific It is used for macaroni-making, and is cultivated to a small extent in Southern Europe, but is not usually considered productive.

Squarehead, also called *Chili, Club, Hedgehog or Dwarf Wheat*, as its name implies, has a short, compact, broad head. The chief recommendation of these wheats is that they usually hold their grain, so that stripping operations can often be delayed with safety, and the straw is generally short and strong. Their grain, however, is often of a soft nature, and not so valuable for millers as that of many wheats with more slender straw. There is no difference, practically, between their grain and that of the softer kinds of ordinary wheats.

Common or Ordinary Wheats.—Nearly all the varieties grown in the State belong to this class. In most the heads are bald, but in some countries bearded varieties are preferred, as they are less subject to the attack of birds; this is the case in Rhodesia.

Spring and Winter Wheats.

In Canada and parts of the United States, where the winters are very severe, common wheats are divided into the sub-classes winter and spring, according to the time they are sown. From a botanical standpoint there is no difference between them. Some hard wheats and many of the soft class can be sown in autumn or winter and are able to withstand the severe frosts, while other less hardy sorts, *e.g.*, the Manitoba or Fife wheats, are sown in the spring and mature in a little over three months. The former are therefore called winter and the latter spring wheats. According to Dondlinger† "A winter wheat can in three seasons be changed into a spring wheat by sowing it regularly in spring; and conversely, a spring variety can be made a winter wheat by sowing for a few successive seasons in autumn or winter."

We have been in the habit of sowing all our varieties as winter wheats, but it may be advisable in the coldest parts of the State, where severe frosts

* "The Cereals in America," p. 48. † "The Book of Wheat," p. 51.

occur late in the season, to sow in the spring, and for this purpose the Manitoba or Fife wheats are to be recommended. As we have not carried out experiments with spring sowing, we are unable to say what other varieties are likely to give good results under such conditions. Sir Joseph Carruthers has found that at Jindabyne wheats of this class have given a crop from second growth made after a severe frost, which points to the desirability of sowing in the spring in that district, where autumn and winter sowings have usually been a failure.

Spring sowing, however, involves the risk of damage by rust, should the season be favourable for this pest, and the yield will not be so great as with winter sowing; consequently, heavier seeding will be necessary in such a case

Varieties have been classified by the Department according to the districts for which they are suitable and according to their grain, hay or green fodder and silage specialities. Should growers receive untried samples of seed from abroad, it is safe, as a rule, to sow wheats from a cold country such as Canada, England and Russia, early, and wheats from such hot countries as India and North Africa late in the season, to secure best results. It takes a few years for an introduced wheat to become properly acclimatised.

Rust-proof Wheats, so called, are often less prolific than ordinary varieties, and no wheat has yet been found proof against the disease, though some escape, and others resist, the rust. It is not wise to expect too much of a variety which is given this name; in most of those we have handled, the grain has been soft and rather inferior.

Specimens of Lucerne.

A couple of lucerne plants, one with a broad leaf, the other with a narrow leaf, were submitted by a farmer at Moruya to the Department for identification. Mr. E. Breakwell, Economic Botanist, reported:—There appears to be no doubt that the two plants belong to the same species, and are analogous to the Hunter River type of lucerne. Variations in the size of leaves, the colour of the flowers, the thickness of stem, &c., are strikingly common among lucerne plants belonging to the same species, and it is often on such variations that new strains are evolved. Both plants were affected with the Leaf Spot. This may to a certain extent impair their vitality. To lessen the extent of this disease, good surface drainage is essential, and, in addition, a rapid succession of close mowings is desirable. Cut sufficiently often to prevent the fungus obtaining a root hold before the crop is again cut. The lucerne, when cut, should be removed from the paddock before it is quite dry, otherwise the leaves will fall off and remain to propagate the disease.

Jute.

THE suggested resolution of the Cowra Branch of the Farmers and Settlers' Association, "That the Department of Agriculture be requested to take immediate steps towards the possibility of establishing the jute industry," recalls the early experiments of the Department with this crop, and draws attention to the limitation to its introduction on a profitable basis to this State.

The industrial significance of the plant and its close connection with the crop production of New South Wales is apparent to every farmer, and it would obviously tend to make the State far less dependent upon outsiders were it possible to grow the jute necessary to bag our wheat and bale our wool.

But a close examination of the factors of the problem will show how elusive is the hope of inaugurating the industry in Australia.

At the present time the commercial cultivation of jute is practically restricted to British India, and it is there the second most important single agricultural product, the leading place being taken by rice. Its cultivation is sparingly carried on in China, Japan, and Tonkin. It has been attempted in the southern United States, but in this case has been met with a larger measure of failure than success.

With the single exception of cotton, jute, considering the quantity and value of the raw product, is the most important vegetable fibre known. Of the raw product, from thirteen to fourteen million pounds' worth is exported from India annually, in addition to the hundred million sacks exported from Calcutta alone, which does not include the vast number absorbed locally.

As an indication of our own dependence upon India in this respect, it may be mentioned that during 1911 the imports into Australia were as follow:—

Bags and Sacks for	Country of Origin.	Quantity.	Value.
			£
Corn and flour	India...	812,496 doz.	210,171
do	Elsewhere	627 ,,	121
Bran, chaff, and compressed fodder...	India	259,193 ,,	48,201
do do	Elsewhere	... ..	.....
Potatoes, onions and coal	India...	28,750 ,,	6,509
do do	Elsewhere	48 ,,	9
Ore	India...	40,368 ,,	4,867
Wool packs	,, ...	954,768	112,084
do	Elsewhere	2,279	463

Cultivation.

Jute is derived from two species of Corchorus indigenous to Northern India, known respectively as *Corchorus capsularis* and *C. olitorius*, Linn., the former being the better variety.

For the best results, strong, moist bottom lands, the richer the better, are required. A sandy loam which can be worked into a fine seed-bed is the best, as the jute seed is exceedingly small. Stiff clay soils are not very suitable, as it is impossible to get them into the fine friable condition which the plant requires.

In India jute is extensively rotated with rice, as it was long ago ascertained that cropping with jute exterminated those weeds whose burden makes the rice planter's life no sinecure. It is there held that some quality in the jute plant is inimical to weed growth, but the probable cause is the smothering out of weed life owing to the rapid growth and dense shade afforded by the jute. It is also of interest to note that in the Philippines the crop appears immune to the attacks of locusts.

Drought is prejudicial to success, and, on the other hand, the young plants are very sensitive to moisture at the root, hence floods at the early stages are detrimental. It is not aquatic in the way that rice is.

The seed is broadcasted at the rate of 10 lb. per acre and lightly covered by means of harrows. When the plants are about a foot high they must be thinned out to distances of 4 inches apart. If allowed to grow closer, the plants get weak and thin.

Flowering occurs about four months after planting, and it is at this stage that the stems furnish fibre of the finest quality. Left until the seed has fully matured, the yield is considerably increased, but at a sacrifice of value. Cutting is done with a sickle; but demonstrations have shown that a vast saving of labour results when the mowing machine is used.

The crop should be cut close to the ground and allowed to lie in small heaps for a couple of days, when the leaves drop freely. They are then carried to the waterside for "retting," which is effected in stagnant or running water by placing the bundles, butts outward, into the water and weighting them down with loaded planks.

A quicker fermentation and speedier completion of the finished product is obtained in stagnant water, but a more brilliant and higher priced fibre is obtained when "retting" in flowing water.

When the pulp slips freely the process of fermentation has sufficiently advanced, and the process of decortication is then easily effected by a workman entering the water, gathering a bundle of the stems, and beating them upon the surface of the water, when a bundle of pure fibre is left. This is washed in clean water, exposed to the sun to dry, and packed in bales of 3 or 4 cwt. when the article is ready for market. If properly prepared, the fibre should be several feet long, of a bright brown colour, and of a glossy appearance.

Returns are naturally variable according to soil and weather conditions, but a fair and conservative average of value for India has been taken as £12 per hectare (approximately 2½ acres), or about £4 16s. per acre.

Experience in New South Wales.

In the early days of the Department's history directions for sowing seeds of jute were issued, and small packets of seed supplied, to various farmers on the North Coast.

The districts in which the crop was most successfully grown were Alstonville, Ballina, Boat Harbour, Byron Bay, Condong, Cooper's Creek, Coraki, Coramba, East Kempsey, Grafton, Marlee, Murwillumbah, Pimlico, Pokolbin, Stuart's Point, and Tintenbar. In places it grew to a height of 10 or 11 feet, and several fine samples of fibre of good quality, both as regards texture and appearance, were prepared,

Fear was expressed at Byron Bay that the plant might become as great a curse to the district as *Sida retusa* (a somewhat similar fibre plant growing all over the Richmond and Tweed districts and classed as a noxious weed), and it was therefore destroyed.

Conclusions.

From the facts mentioned it is obvious that, while there are good grounds for believing that the crop can be grown in New South Wales, there is little cause for cherishing the ambition of establishing the industry. The fact that so many other countries with the unquestionable advantage of similar climate and cheap coloured labour have failed to assail the apparently impregnable position of India as the chief producer of jute, leaves little ground for anticipating that Australia can ever attempt the possibility of supplying even a tithe of its own needs.

Under any circumstances the labour involved is the heaviest item, as much of it cannot possibly be replaced by machinery, and the process of "retting," as already outlined, does not appeal to Australians as a suitable outlet for their energies.

For first-class land, on which alone jute will thrive, the prospect of obtaining a gross revenue of £5 per acre is not likely to displace dairying or the growing of maize and lucerne.

Above all, it is obvious that very considerable amounts of capital would be necessary for mills and plant to handle the raw product (as in the manufacture of cane and beet sugar), extensive areas would need to be laid down to the one crop, and a guaranteed output arranged for.

In the end there could not possibly be any reduction in the cost of the bags for the farmer or bales for the wool-grower, which would be the only justification for initiating the industry.

Exports and Cold Storage.

H. V. JACKSON.

Rabbits and Hares.

The quantities of rabbits and hares packed and frozen in New South Wales during the year ending 31st December, 1912, were as follow :—

Rabbits.	
January to June, 1912	284,185 crates.
July to December, „	136,486 „
Total	420,671 crates.

The above number of crates equals 10,096,104 single rabbits.

Hares.	
January to June, 1912	264 crates.
July to December, „	474 „
Total	738 crates.

The quantity of rabbits and hares exported was 5,110,165 pairs, valued at £252,053, being a decrease of 1,796,281 pairs, and showing a shortage in value of £78,701, in comparison with 1911.

The rabbit and hare skins exported amounted to 5,224,410 lb., value £318,930; being an increase in value exported, as compared with last year, of £22,252.

The value of frozen rabbits and hares, and of skins exported, totalled for 1912 the sum of £570,983, or a decrease in comparison with 1911 of £56,449.

Rabbit-packing and freezing was carried on during the winter months at works in Sydney as under :—

Birt & Co., Limited, Pyrmont.
Fresh Food and Ice Co., Limited, Darling Harbour.
Metropolitan Ice Co., Limited, Harris-street.
Sydney Ice Skating Rink and Cold Storage Co., Limited, Sydney.

Work was also continued at freezing works in the country as follow :—

The Country Freezing Co., Limited, Harden.
„ „ „ Dubbo.
„ „ „ Warrigal.
„ „ „ Blayney.
„ „ „ Young.
„ „ „ Gunnedah.
„ „ „ Canowindra.
Bungendore Freezing Co., Limited, Bungendore.
Braidwood Freezing Co., Limited, Braidwood.
Crookwell Refrigerating Co., Limited, Crookwell.

Dunedoo Refrigerating Co., Limited, Dunedoo.
Lachlan Freezing Co., Limited, Cowra.
J. Moore, Orange.
Mudgee Freezing Works Co., Limited, Mudgee.
G. J. Rohr, Wagga.
W. White, Limited, Tumut.
" " Cootamundra.
Wilson and Flood, Bathurst.

Twenty-two freezing works were in operation during the year 1912.

Poultry and Eggs.

It is estimated that over 12,366 cases of eggs were held in the cool stores during the season 1912–13.

The following are the figures for the past fifteen years:—

1898	...	11,000 dozen.	1906–7	...	150,322 dozen.
1899	...	93,000 "	1907–8	...	250,000 "
1900	...	96,000 "	1908–9	...	305,044 "
1901	...	140,292 "	1909–10	...	329,976 "
1902–3	...	130,524 "	1910–11	...	420,372 "
1903–4	...	151,128 "	1911–12	...	564,372 "
1904–5	...	253,908 "	1912–13	...	444,996 "
1905–6	...	288,648 "			

Besides the above, some 5,226 tins of pulp eggs were held in stores.

ESTIMATED LIVE POULTRY on Farms and Holdings of 1 acre and upwards.

At end of Year.	Fowls.	Ducks.	Geese.	Turkeys.	Other.	Estimated Number of Eggs obtained during Year.
	No.	No.	No.	No.	No.	doz.
1908	2,721,986	229,870	25,631	193,613	24,514	11,305,299
1909	2,672,385	257,741	25,878	224,187	36,000	12,096,859
1910	3,072,375	315,550	28,980	244,456	35,015	13,204,906
1911	3,213,200	321,400	26,200	232,500	4,600	13,637,000

It will be seen that from the year 1908 to 1911 the poultry on holdings of one acre and over increased by over 600,000 head, and eggs by over 2,300,000 dozen. The increase, it is believed, has been as proportionately large on areas under one acre.

Imports.

QUANTITY OF PRODUCE inspected under the Quarantine Act (Plants), 1911.

Description.	January to June.	July to December.	Total.
Bananas (bunches)	211,668	247,958	469,626
Pineapples and bananas (cases)	16,770	13,682	30,452
Fruit (centals)	15,754	66,055	81,809
Cereals, pulse, &c. (centals) ...	677,059	696,083	1,373,142
Vegetables, corms, &c. (centals)	26,064	376,748	402,812
Nuts (centals)	13,555	15,449	29,004
Plants (number)	160,450	9,282	169,732

Exports.

QUANTITY OF PRODUCE inspected under Commonwealth Commerce Act, for twelve months ending 30th June, 1912.

Description.	Packages.
Canned Fruit	4,033
Fruit	153,032
Honey	85
Jam	6,575
Leather	14,842
Maize	2,885
Millet	37
Plants	877
Potatoes	24,823
Seeds	7,755
Hares	884
Rabbits	479,686
	695,514

PRODUCE inspected under the Commerce Act from 1st July to 31st December, 1912.

Description.	Packages.
Canned Fruit	1,183
Fruit	90,970
Honey	52
Jam	2,947
Leather	8,948
Maize	583
Millet	111
Plants	416
Potatoes	3,929
Seeds	2,322
Hares	463
Rabbits	253,966
	365,890

PRINCIPAL ARTICLES imported oversea during 1912.

	£
Ale and beer	219,759
Apparel and soft goods	6,338,019
Boots and shoes	238,573
Confectionery	169,040
Cordage and twine	330,257
Fish—All kinds	281,826
Fruits—Fresh	118,699
Gold	1,048,792
Hats and caps	207,172

PRINCIPAL ARTICLES imported oversea during 1912—*continued*

	£
Implements—Agricultural	207,522
Iron and steel—Bar, rod, &c.	801,186
,, Galvanised sheet...	709,771
Leather	225,996
Machines and machinery	2,080,646
Metal manufactures	2,068,470
Milk—Preserved	5,622
Oil—Kerosene	163,366
Spirits	584,087
Sugar	558,448
Tea	613,084
Timber	1,342,505
Tobacco, cigars, &c.	519,871
Wine	23,608
Other articles	13,413,317
Total	£32,269,656

PRINCIPAL ARTICLES exported oversea during 1912.

	£
Animals—Horses	55,537
Butter	1,080,557
Coal	1,145,545
Copper, ingots	2,270,450
Fruits—Fresh	45,834
Gold	4,083,020
Grain—Wheat	1,619,107
Flour	340,675
Lead	1,467,961
Leather	364,050
Meats—Beef	98,244
Mutton and Lamb	555,557
Rabbits and Hares	252,053
Preserved	310,999
Oil—Cocoanut	196,399
Ores—Spelter, &c.	1,162,756
Silver—Bullion	321,916
Skins—Hides	629,409
Sheep	413,294
Rabbit and Hare	318,930
Other	545,698
Tallow	668,763
Timber	250,819
Tin, ingots	444,464
Wine	19,673
Wool	11,820,149
Other articles	2,471,517
Total	£32,953,326

Trials of Broom Corn.

In September, 1912, the Department of Agriculture received from the Bureau of Plant Industry, Washington, U.S.A., in response to a previous request, samples of three approved varieties of broom corn for trial, viz., Dwarf Standard, Dwarf, and Standard. It was stated that the Dwarf Standard had been reduced by selection to a dwarf stature, but still produced a standard brush.

Packets of the seed were sent for trial to the Hawkesbury Agricultural College and the Bathurst, Grafton, and Yanco Experiment Farms.

At the Hawkesbury Agricultural College, owing to the dry season, the crop proved an absolute failure. White Italian was grown as a check, and grew to a height of 3 feet, the Standard growing to a similar height, while Dwarf and Dwarf Standard reached 2½ feet. During growth, and when in head, the White Italian appeared slightly superior to the others.

At the Bathurst Experiment Farm the season was also decidedly unfavourable for this crop, and it was not possible to obtain any figures showing the comparative yields. The Dwarf and the Dwarf Standard were vigorous in growth, reaching a height of 3¾ feet, but were later in ripening than ordinary broom millet, and the brushes were short and of inferior quality. The Standard grew to a height of 5½ feet, and gave some very fine plants of good quality. The yield was light, on the whole, and the seed of a paler colour than the White Italian. The last-named, which is the usual variety grown at Bathurst, proved the best all-round type. It grew to a height of 6 feet, yielded better than the others, and produced the best and largest brush.

At the Grafton Experiment Farm the Dwarf varieties germinated satisfactorily, but the Standard came up rather thinly. The number of days taken to reach the same stage of maturity was:—Standard, 99 days; Dwarf, 122 days; and Dwarf Standard, 130 days. One hundred feet of a row of each variety was examined at the same stage of ripeness, with the following result:—

Variety.	First-class Brushes.	Second-class Brushes.	Length of Brush.	Height of Stalk.
			inches.	ft in.
Dwarf	131	131	11·8	3 11
Dwarf Standard	117	44	16·5	4 5
Standard	73	27	21·4	8 2½

This classification into firsts and seconds only refers to quality and not to length.

The results seem to be in favour of the Standard, which, besides being earlier than the other varieties, is nearer the trade requirements for the manufacture of brooms. The average length of brush permits of it being included in the "hurl" class. The Dwarf varieties could only be classed as "insides." The Dwarf, in fact, is rather too short even for this, the lowest grade.

Although not tested side by side, it is very evident that none of these imported varieties are comparable with the best local varieties, although acclimatisation may result in raising the standard considerably.

At the Yanco Experiment Farm the seed was sown on 8th September, 1912, in rows 3 feet apart, with the Planet Junior seed-drill. During growth the crop was irrigated and cultivated whenever necessary until it had made full growth. Before the heads began to spread with the weight of the seed they were turned down in the usual manner. At maturity the Standard was 7 feet high, and the Dwarf and Dwarf Standard 4½ feet. At the end of March the heads were cut, brought into the shed, and cured.

The broom of the Dwarf and Dwarf Standard was much too short to be of any use except as the low-grade "insides" used in broom-making. The Standard produced a good long broom and appeared worthy of further trial. The broom of all three varieties was considerably discoloured by the attacks of aphis.

From the reports above quoted it is apparent that it is only advisable to continue the trial with only one of the varieties—viz., Standard—and arrangements have been made by the Acting Under-Secretary and Director of Agriculture with the Principal of the Hawkesbury Agricultural College and the managers of the Bathurst, Grafton, and Yanco Experiment Farms to plant seed of this side by side with seed of the local variety known as the White Italian, and also a variety recently obtained from Italy. The trial can hardly be taken as a fair test this year, as the Italian seed will not be acclimatised, but it will serve as a basis for further experiments later on.

Stone *v.* Brick Silos.

Stone for silo walls requires to be roughly squared, otherwise good bonding cannot be made. The walls would need to be from 14 to 18 inches thick, and it would require not less than 2 cubic feet of mortar for every 25 cubic feet of masonry. The mortar should be made of 3 parts sand to 1 of unslaked lime, and when required for use mix 1 part of dry cement with 10 parts of lime mortar.

A brick silo requires the walls 9 inches thick, set in similar mortar, and plastered on the inside only with a ½-inch thickness of 3 to 1 sand and cement mortar, similar to an underground tank.

The comparative cost would be, with bricks at 30s. per 1,000, in favour of the brick silo, as the labour at current rates for the stonework would amount to more than the cost of labour and material for the brick silo. I should advise that the brick silo be built.—A. Brooks.

Field Experiments with Maize, 1913.

SEED-CORN EAR TEST.

HAWKESBURY AGRICULTURAL COLLEGE.

A. V. DONNAN, Experimentalist.

THE Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that final conclusions cannot yet be drawn from these trials, as they have only been conducted for a year or two. Later, when results for, say, five years are available, a summary will be prepared, as sufficient evidence should then be available to enable conclusions to be formed. Meanwhile it is felt that the public are entitled to know the results obtained each year.

Object.—To determine the advisability or otherwise of testing the germinating power of maize, and grading it according to the results of the test before using it for seed.

Method of Procedure.—A number of maize cobs are selected from the store of seed maize and tested for their germinating power. The grain from cobs showing good germinating power and that from cobs showing unsatisfactory germinating power are sown in separate plots. The results from these two sets of plots are compared with each other and with the results from check plots, sown with an average sample of grain from cobs selected, without testing, from the store of seed maize.

Variety of Maize.—The experiment was carried out with Red Hogan.

Particulars of Germination Test.—Thirty-six cobs of typical Red Hogan seed maize were taken at random from the store and placed under test. At the same time similar cobs were selected to plant buffers and check plots.

From each of the thirty-six cobs six grains were chosen. Sketch A shows the method of choosing the six grains from each cob so that the grains may be representative of the cob. A piece of double blotting paper was ruled into numbered spaces each 2 inches square. Each cob was numbered and the grains from each cob placed in the square having the same number as the cob. The blotting paper was placed in contact with moist soil in a tin, and the grains were covered by another piece of blotting paper, the whole being kept moist throughout the experiment.

Germinating Power of the Cobs.—The test began on the 9th September and ended on the 24th September. In Table A will be found details of the germination of the various sets of grains. As a result of the test, cobs Nos. 2, 5, 7, 19, 22, 23, 26, 29, 30, 32, and 33 were selected as cobs of high germinating power, and cobs Nos. 3, 4, 9, 11, 16, 17, 18, 20, 25, 35, and 36 were chosen as cobs of low germinating power.

Shelling.—In shelling the grain from the three sets of cobs, "high," "low," and untested, the usual procedure of discarding the grain from the ends of the cobs was followed.

The Soil.—The soil on the block on which the experiment was carried out this year consists of, to all appearances, a uniform clay loam.

Previous History.—Prior to the present experiment the land was cropped as follows:—

1910. Wheat varieties.
1911. March to August, Swede turnips.
1911–12. Beans (varieties).

Preparation for Planting.—After the beans had been harvested the ground was ploughed on 21st June, 1912. It was ploughed again on 7th September, rolled and harrowed on 12th September, and harrowed and rolled on 24th September, being then ready for sowing.

Planting.—On 25th September drills were run out 4 feet apart and 5 inches deep with a long mouldboard plough and the maize planted with a corn dropper 1½–2 inches deep in the drills. Eight lb. of seed were sown per acre.

Arrangement of Plots.—Sketch B shows the arrangement of plots throughout the block.

Fertiliser Applied.—The following was applied per acre through the fertiliser attachment on the corn dropper:—

Superphosphate...	...	80 lb.
Bonedust ...	...	80 lb.
Sulphate of Potash	...	45 lb.
Dried Blood ...	...	45 lb.

After-treatment.—The crop received the following treatment after planting:—

25th Sept.—(After planting)—rolled ground; between rows was harrowed.
1st Nov.—Rolled and harrowed whole plot.
11th Nov.—Cultivated with Planet Junior tooth cultivator.
25th Nov.— ,, ,, ,, ,,

Notes on Growth.—The germination throughout was from fair to good. There was a small difference in germination in favour of the "high" grain, that of the "low" and check (untested) being much the same. Despite the adverse season the crop made fair growth, being 5 feet high at the beginning of December. By the end of December the crop was in full flower and cobbing. The rain which fell late in December helped the crop for some time, but as the weather during January and February, 1913, was excessively hot and dry the maize failed at a critical stage. Early in March heavy storms caused the bulk of the crop to lodge. The cobs, however, were not mixed and on 14th April they were pulled, husked in the field, and brought into the shed. Beyond the difference in germination, noted above, none was observed in the growth of the various adjacent plots

On 7th and 8th May the cobs were shelled.

Results.—In Table B will be found the yields—actual, natural and percentage.

Average yield per acre of—

10 "High" plots = 19 bushels 19 lb. = 120·85 per cent. of check.
10 "Check" plots = 16 bushels = 100 per cent.
10 "Low" plots = 15 bushels 40 lb. = 98·21 per cent of check.

In the average percentage yields it should be noted that the percentage yields of plots Nos. 26 and 29 ("High" plots) and Nos. 27 and 30 ("Low" plots) have been inflated by the unaccountable failure of "Check" plot No. 28. Thus we find that "High" plots average 126·89 per cent. and "Low" plots 104·37 per cent., or 6·05 and 6·16 per cent. respectively more than by comparison of average yields.

Conclusions.—The increased yield of the maize grown from the "High" grade of cobs was due to—

1. More even germination.
2. Greater vitality, enabling it to produce more grain.

This increase in yield amounted to 3 bushels 19 lb. per acre over "check" seed and 3 bushels 35 lb. per acre over "Low" grade seed.

The position of the yield of the "Check" grain with regard to the "High" grade and the "Low" grade would simply depend on the quality of the cobs selected. In the present test it appears that the germinating power of the cobs—which could only be ascertained by test—was low.

Origin and Quality of Seed.—The cobs selected for the test were harvested from the 1911–12 maize crop at the College. As 1911–12 was a bad season there was more variation in the quality of the cobs than after a good season. In such a case as this, a seed-corn ear test previous to planting becomes of more than ordinary value because there is more culling out necessary in order that only seed of the very best quality may be planted.

Rainfall during growth:—

September	...	1	point.			
October	...	92	points,	biggest fall	30	points.
November	...	341	"	"	176	"
December	...	277¼	"	"	218	"
January	...	72½	"	"	18	"
February	...	64	"	"	35	"

Total to end of February, 843¾ points for five months.

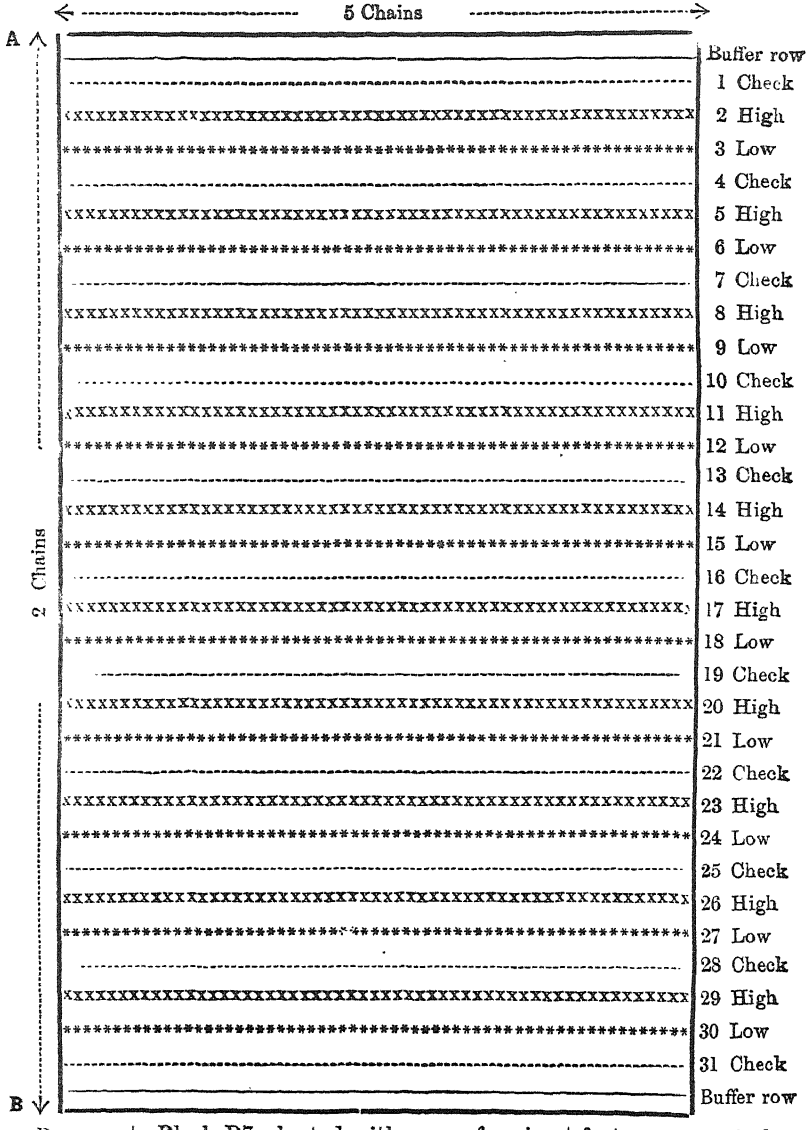
Heavy rain falling in March had no effect whatever on the crop, as by that time all growth had ceased and the grain which had fully formed was hardening off. Considering that the crop was practically without rain from the 24th December until ripening off in March, the average yield per acre—16 bushels 55 lb.—cannot be considered low.

Sketch A.

Showing the method of selecting the six grains from each cob.

The grains chosen are represented by crosses on an imaginary spiral running from A to B. The grains, being chosen from different rows and at regular places along the length of the cob form a fair sample of the grain in the cob.

Sketch B.



Represents Block B7 planted with rows of maize 4 feet apart. Each row constitutes one plot $\frac{1}{58}$ acre in area.

Dotted black lines represent rows sown with untested grain (check plots), Nos. 1, 4, 7, and so on. Lines marked xxxxx represent "High" rows, *i.e.*, rows sown from cobs of high germinating power. Lines marked **** represent "Low" rows, *i.e.*, rows sown from cobs of low germinating power.

NOTE.—Variation of soil as shown by growth of crop (difference in depth and water-holding capacity) extends in direction AB.

TABLE A.

Showing particulars of germination test.

No. of Cob.	No. of Grains with Roots ¼ inch long in 11 Days.	No. of Grains germinated in 15 Days.	Remarks.
1	3	4	Medium growth.
2	6	6	,, ,,
3	1	2	Bad ,,
4	2	2	,, ,,
5	6	6	Vigorous ,,
6	5	5	Medium ,,
7	6	6	Vigorous ,,
8	5	5	Medium ,,
9	0	3	Bad ,,
10	6	6	Medium to good growth.
11	4	4	Fair growth.
12	4	4	Very bad growth.
13	4	5	Medium and bad growth.
14	2	4	Medium to vigorous growth.
15	4	4	Medium and bad ,,
16	2	4	,, ,, ,,
17	2	4	,, ,, ,,
18	3	3	,, ,, ,,
19	5	6	Vigorous growth.
20	1	5	Bad ,,
21	4	4	Vigorous ,,
22	5	5	,, ,,
23	5	5	,, ,,
24	1	4	Bad to vigorous growth.
25	2	2	Medium growth.
26	5	5	Vigorous ,,
27	4	5	Medium to vigorous growth.
28	1	5	Bad ,, ,,
29	5	6	Five vigorous, 1 bad ,,
30	6	6	Very vigorous ,,
31	4	5	Bad to vigorous ,,
32	5	5	Vigorous ,,
33	3	5	,, ,,
34	2	5	Bad to vigorous ,,
35	3	3	Two vigorous, 1 bad ,,
36	1	3	Medium.

Nos. 2, 5, 7, 19, 22, 23, 26, 29, 30, 32, and 33 were selected as cobs of high germinating power, and

Nos. 3, 4, 9, 11, 16, 17, 18, 20, 25, 35, and 36 as cobs of low germinating power.

TABLE B.

Showing actual, natural, and percentage yields from the various plots.

No. of Plot.	Yield per Plot.	Germinating Power of Seed.	Actual Yield per Acre.		Natural Yield per Acre.		Percentage Yield.
	lb.		bush.	lb.	bush.	lb.	
1	39	Check	22	55	22	55	100
2	44	High	25	52	20	29½	126·32
3	33	Low	19	25	18	4	107·61
4	26·5	Check	15	34½	15	34½	100
5	39·25	High	23	7	19	3	121·39
6	34	Low	20	2	22	27½	89 08
7	44	Check	25	52	25	52	100
8	37	High	21	45	23	26½	92·89
9	33	Low	19	25	21	1	92·52
10	31·5	Check	18	31½	18	31½	10
11	37	High	21	45	20	5	108 56
12	36·25	Low	21	20	21	34	98 86
13	39·25	Check	23	7	23	7	100
14	41	High	24	9	21	6½	114·42
15	30·5	Low	17	54½	19	6	94·09
16	29	Check	17	5	17	5	100
17	32	High	18	48	14	27	130· 7
18	24	Low	14	8	11	40½	119·01
19	15·75	Check	9	16	9	16	100
20	20·25	High	11	52	10	17½	115·71
21	15·5	Low	9	½	11	19	80·52
22	21·0	Check	12	21	12	21	100
23	24·5	High	14	24½	12	37½	113·95
24	16	Low	9	24	12	54	72·73
25	22·5	Check	13	14½	13	14½	100
26	24·75	High	14	33	10	48	134 39
27	23·5	Low	13	47½	8	25	163·95
28	10·25	Check	6	2	6	2	100
29	28·5	High	16	44	7	53½	211·11
30	21	Low	12	21	9	49	125·38
31	20	Check	11	44	11	44	100

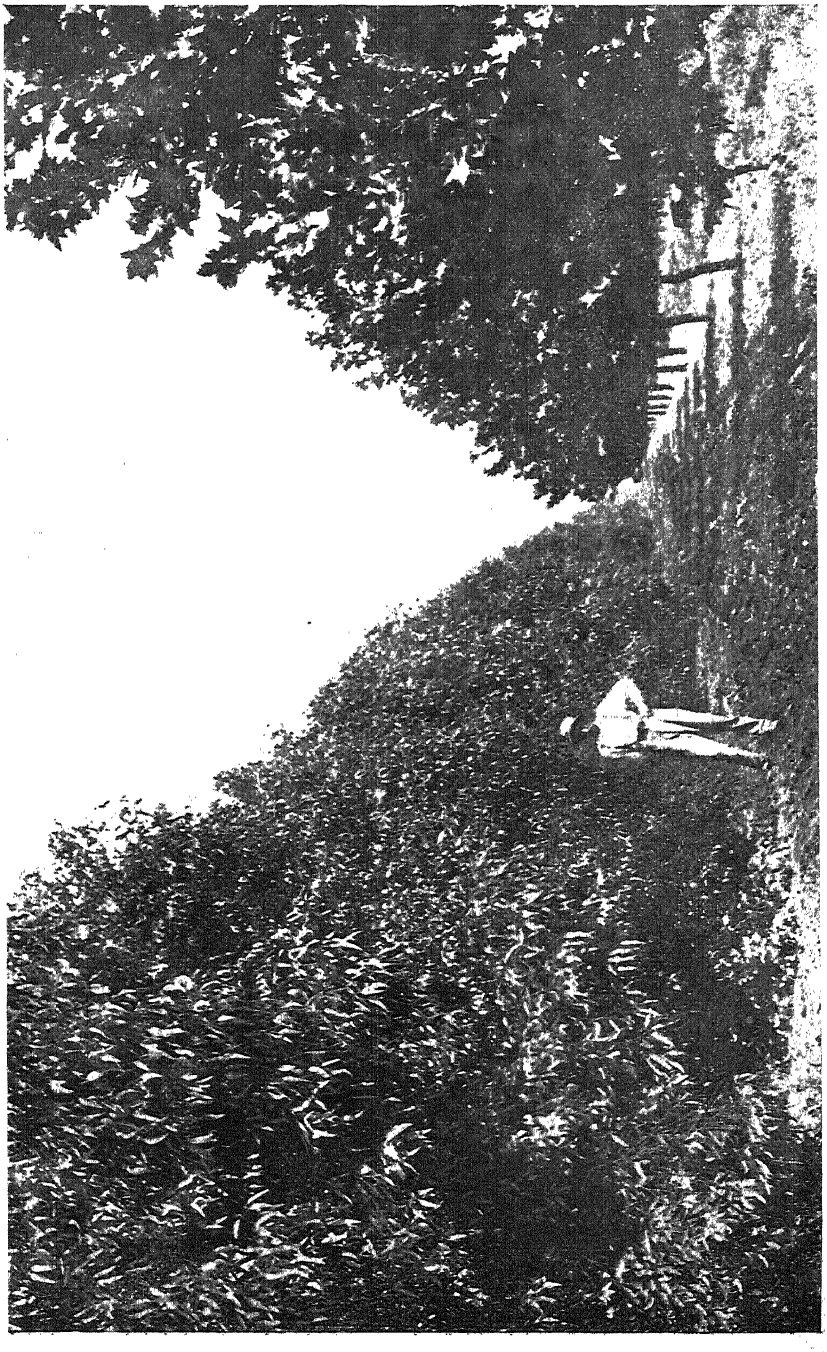
The average yield per acre of—

10 high plots = 19 bushels 19 lb., or 120·85 per cent. of check.
10 low plots = 15 „ 40 „ 98·21 „ „
11 check plots = 16 „ = 100 per cent.

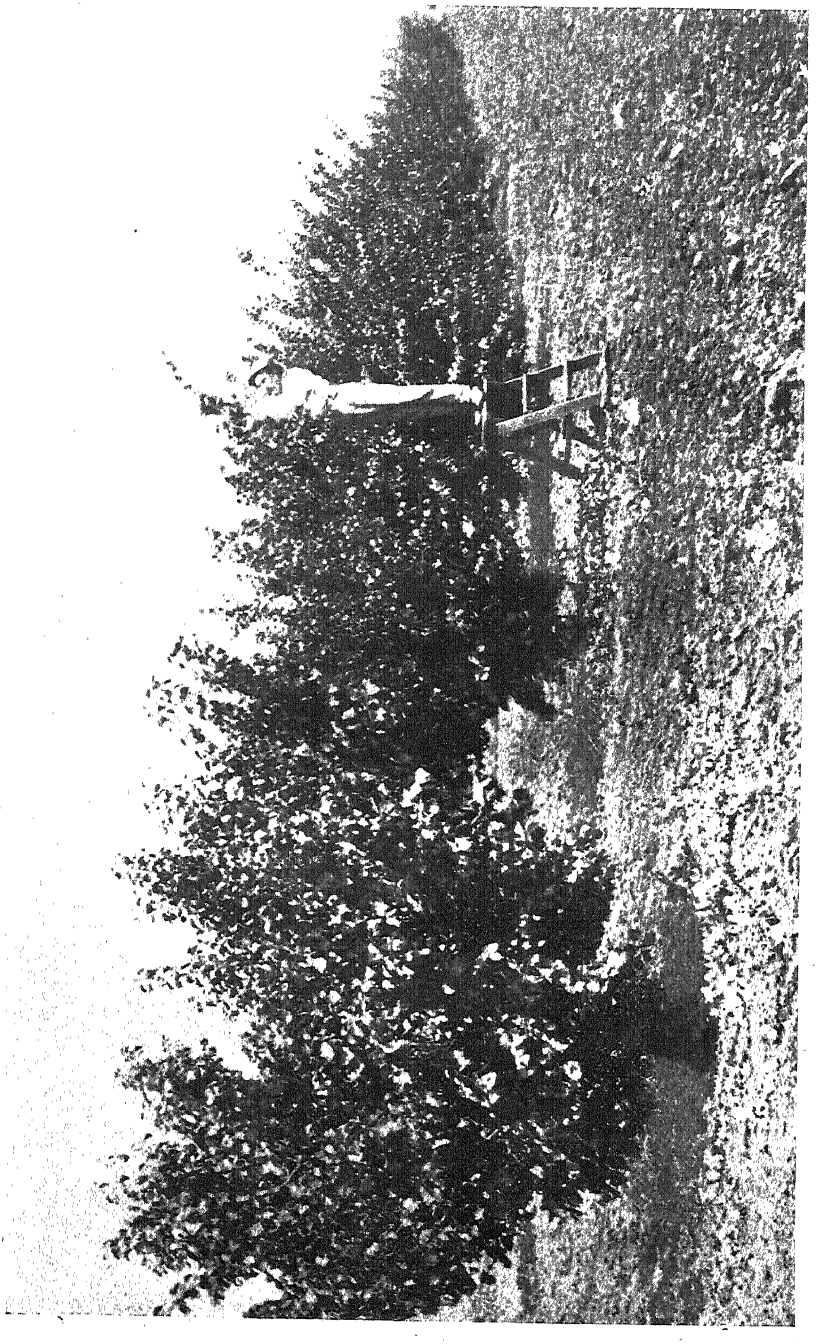
The "actual" yield per acre is based upon the weight of the crop multiplied by the size of the plot.

The natural yield is calculated upon the yield of the nearest two check plots, and is proportional to the distance from each. Its estimation is based upon the assumption that the differences between neighbouring check plots are due to regular and gradual variations in the soil between them. All the check plots are treated as far as possible in exactly the same way; it is therefore reasonable to believe that any difference between neighbouring ones is due to variation in the soil. Because such plots are not widely separated it may also be assumed that any variation would be regular and gradual.

The "percentage" yield of any plot is the proportion which its "actual" yield bears to its "natural" yield, the latter being represented by 100. The "percentage" yield of any check plot is therefore 100.



Windbreak on Yanco Experiment Farm : Sugar Gums on left, Oriental Planes on right.



Apricots Summer pruned and unpruned. Young Plantation at Yanco.

Fruit-Growing Under Irrigation.

W. J. ALLEN.

IRRIGATION is, and always will be, practised more in the drier and more arid districts, where the rainfall is not sufficient to enable the farmer or fruitgrower to produce profitable crops annually. It also acts as an insurance against dry seasons in those districts where the annual rainfall is usually sufficient during winter months, but which occasionally falls below the average. Even where up-to-date methods of tillage are practised, the farmer or fruitgrower must have a certain amount of moisture, without which he cannot hope to harvest profitable crops. Where it is possible to irrigate, and with an assured supply of water, the man on the land is practically independent of droughts—a very enviable position to be in. Since the great advantages of irrigation are becoming known it is not uncommon to see vegetable and fruit growers in our cooler districts following this practice, and, if one can judge by the crops they raise, it must pay them handsomely.

It is, however, recognised that the best results are obtained when irrigation is practised in the arid portion of the State, where the lands are usually rich in potash (K_2O), lime (CaO), and satisfactory in phosphoric acid (P_2O_5). Lands such as these will be served by the great Burrinjuck reservoir, and are known as the Murrumbidgee Irrigation Area, situated in and around the townships of Yanco, Leeton, and Griffith, which are about 200 miles distant from the reservoir. It can readily be seen why lands as rich in fertilising elements as these are superior and very productive. Their superiority is borne out by practice at the Government Experiment Farm, which was started some five years ago, and also by a few settlers who fortunately for themselves, reached Yanco last year in time to put in hay, and vegetable crops. Young fruit trees and vines planted last season have made wonderful growth, and bid fair to hold their own with those growing in what are considered the most favoured spots in Australia. The growth indicated by the illustrations accompanying this article will prove how soon the trees attain a profit-bearing stage. All have been planted within the past five years.

With rich land, and a good supply of water available, we still require the heat in order to obtain best results when fruit trees, vines, lucerne, sorghum, &c., are the principal crops to be grown. It is, therefore, hard to imagine where one could find a more perfect climate, better soil, or more comfortable conditions, than those existing in our western country, and particularly at the Murrumbidgee Irrigation Area, which is situated inland about 200 miles, as the crow flies, or about 368 by rail from Sydney.

The fruitgrower, farmer, or dairyman, who settles on a block under this project, if he puts energy, muscle, and brains into his work, and carries it on intelligently, should show a good profit at the end of the year, *i.e.*, when once the holding has reached the producing stage.

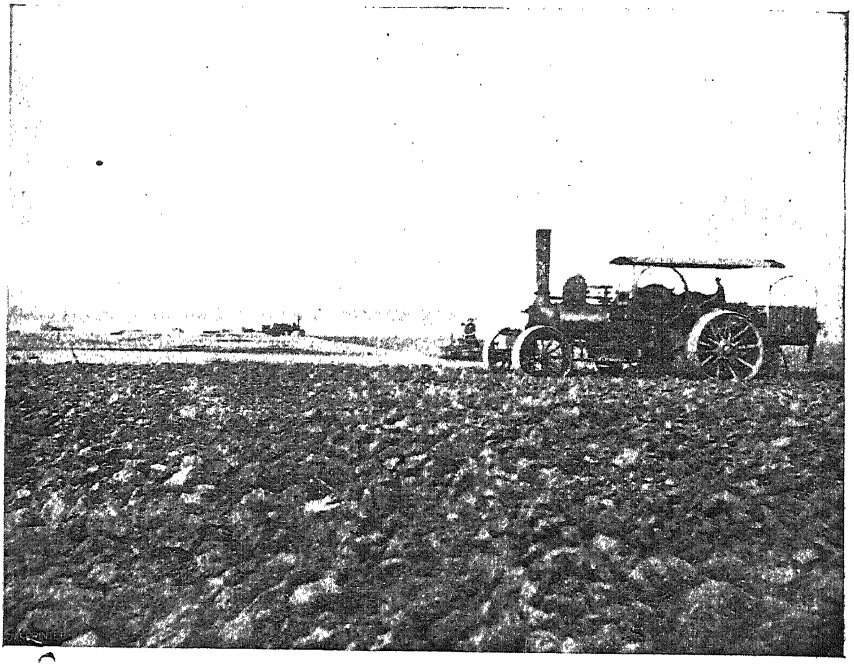
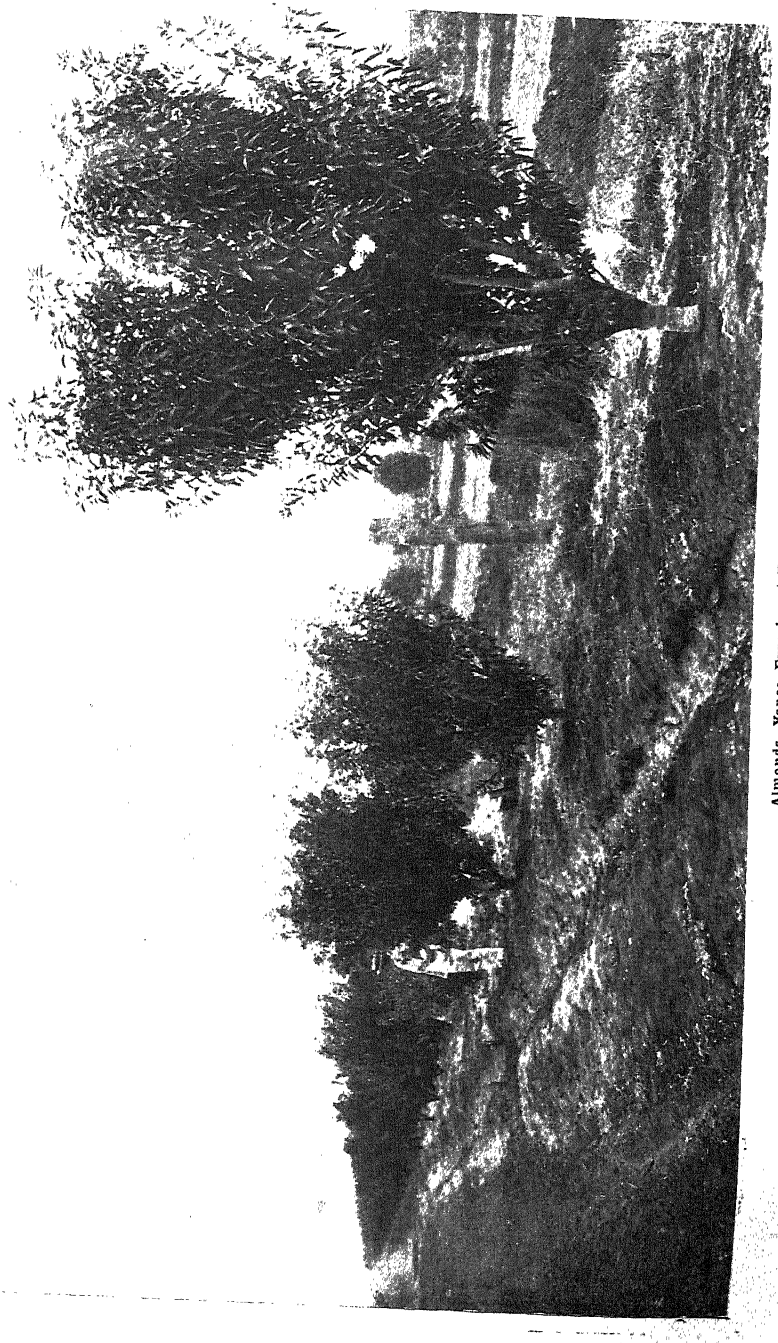


Fig. 1.—20 h.p. ploughing engine at work breaking up the soil.



Fig. 2.—Staking out the vineyard.

The State is doing good work in providing farms suitable for the orchardist, dairyman, or vegetable grower, and is willing to help home-seekers in many ways in order to give them opportunities to go on the land. It



Almonds, Yanco Experiment Farm.



Flame Tokay Grapes, Yanco Experiment Farm.

remains entirely with the enthusiast who takes up the land to show whe her he has the energy and determination to carry out his portion of the work, as if he has he can with every assurance anticipate very satisfactory returns for his labours.

Climate.

The climate of our Central Division, where these lands are situated, is about as perfect and healthy as can be found anywhere in the world. During the winter months—June, July, and August—we have frequently white frosts; but during the last ten years, or so far as I can learn, the thermometer has not dropped low enough to damage orange or lemon trees, and Prairie Grass and Phalaris Commutata can be seen growing during the winter months. The summers are usually clear and dry, with occasional showers. The hottest weather is experienced during January and February, but during these months the thermometer seldom exceeds 106 degrees in the shade, and then only for short periods. It must not be forgotten that it is because of the favourable, bright, warm days during the greater portion of the year that we are able to produce such good crops of superior fruit, lucerne and other fodder crops. Dairying, ostrich farming, and pig raising will prove equally profitable under the existing conditions.

Clearing of the Land.

The trees on most of the land have been thinned out or destroyed altogether. However, there are stumps to be dug out. This work is usually carried out with the assistance of a forest devil or some other device designed to do it as economically as possible, but it means there is plenty of hard work to do until the land is cleared. Both horses and engines are used in breaking up the land. (Fig. 1 shows engines at work.)

Grading.

This work should be carried out as soon as possible after the land is cleared of all trees, stumps and roots. It is best to plough it first, after which the scoop, with from two to four horses hitched to it, is employed for filling in any hollows or removing any bumps on the land. Then the smoother is run over the land either once or twice, according to its condition. After this treatment, it is as well to grow a hay crop the first season, as this gives the settler an immediate return, and it improves the soil. After this crop has been harvested the land may be prepared for either lucerne or trees. The former should be sown about the month of April, and fruit trees and vines should be planted during the months of June, July and August.

If the land is to be sown with lucerne it requires more careful grading than when trees or vines are to be planted, as it not only requires to have a fairly even surface in one direction, but small check banks should be constructed about a chain apart for the purpose of assisting in economical watering.

When trees or vines are to be planted the land should be so graded that there will be a fairly even surface in the direction the water is to be

run. All mounds should be removed, and depressions filled up. The expense of grading the greater portion of the area will not, in my estimation, exceed 15s. to 20s. per acre, and some of it not more than half that amount.



Fig. 3.—Planting the vineyard.

Laying-out and Planting.

After the land is properly prepared and smoothed, it is staked out at different distances apart. If vines are to be planted, small stakes are set from 8 feet x 8 feet to 10 feet x 10 feet apart, according to the variety of grape to be planted; while if it is intended to plant trees the stakes should be set from 20 feet to 27 feet apart, 22 being the happy medium, which is about the best distance to plant on this area. At the distances apart given, the number of trees per acre would be as follows:—

	Trees set septuple.	Trees set square.
20 feet apart	125	109
22 „ „	103	90
24 „ „	86	75

Vines set on the square.

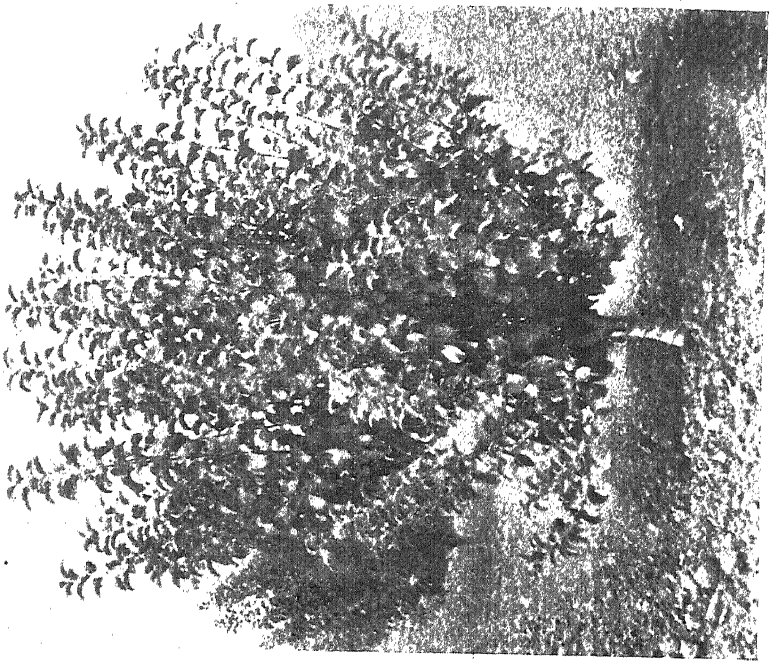
8 feet x 8 feet = 680 vines to the acre
10 feet x 10 feet = 435 „ „

Fig. 2 shows two men staking out for vines, when it will be seen that a wire about 500 feet long is stretched tightly across the field, and stakes are being set every 10 feet.

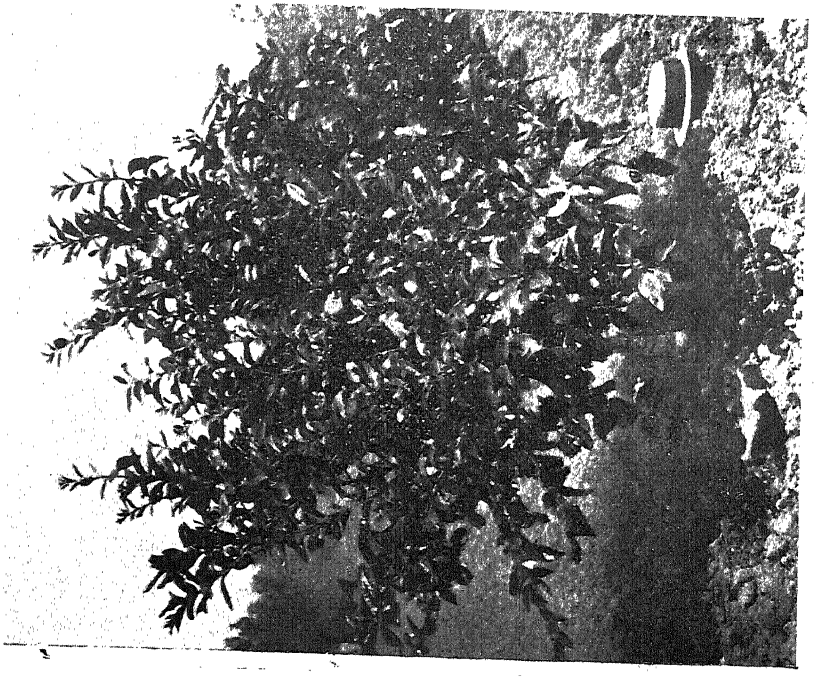
In Fig. 3 a gang of men are digging holes and planting vines.



Delaware Plum, Yanco Experiment Farm.



Apple Tree, Yanco Experiment Farm.



Genoa Lemon, Yanco Experiment Farm.

Fig. 4 depicts a block of 2 acres with holes dug ready to receive trees.

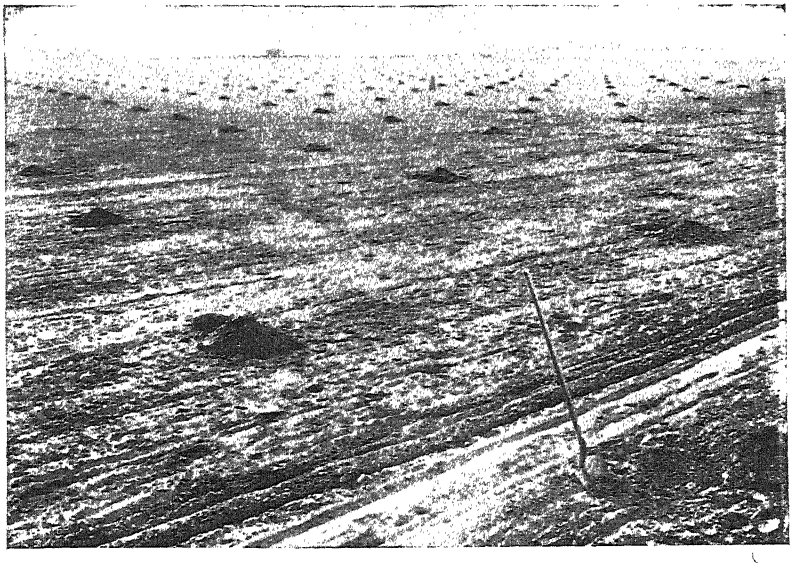


Fig. 4.—Holes dug ready to receive fruit-trees.

Fig. 5 shows two men in the act of planting a tree. Fig. 6 illustrates the same tree pruned in spring before it breaks into leaf.

Fig. 5.—Planting a fruit-tree.



Cost of Trees and vines.

The cost of trees is about £4 per 100 for deciduous and £8 for citrus trees. Rooted vines can be obtained at about £8 per 1,000.

Yield.

Peaches and apricots yield a little fruit the fourth year, and carry profitable crops the fifth. Prunes do not return much until after the sixth year, and the same remarks apply to pears. Owing to the ravages of pear blight in California and other parts of America destroying thousands of acres of the pear trees, there should be a good opening in America for canned pears. Also, since it has been shown that pears can easily be exported to Europe and America when the temperature is kept at about 30 to 31 degrees Fah., we should be able to supply the American markets yearly with thousands of cases of our fruit during the months of March, April, and May.

From about 3 acres of pear trees at the Bathurst Experiment Orchard we have harvested about 600 cases annually for the last six or eight years, and the fruit has sold at from 6s. to 12s. per case. It can therefore be seen that at the lower price we have done well out of pear growing.

Prunes at our Bathurst and Wagga orchards have yielded from a half to one ton of cured prunes per acre. These have sold at from 7d. to 9d. per pound, yielding a gross return of from £30 to £65 per acre.

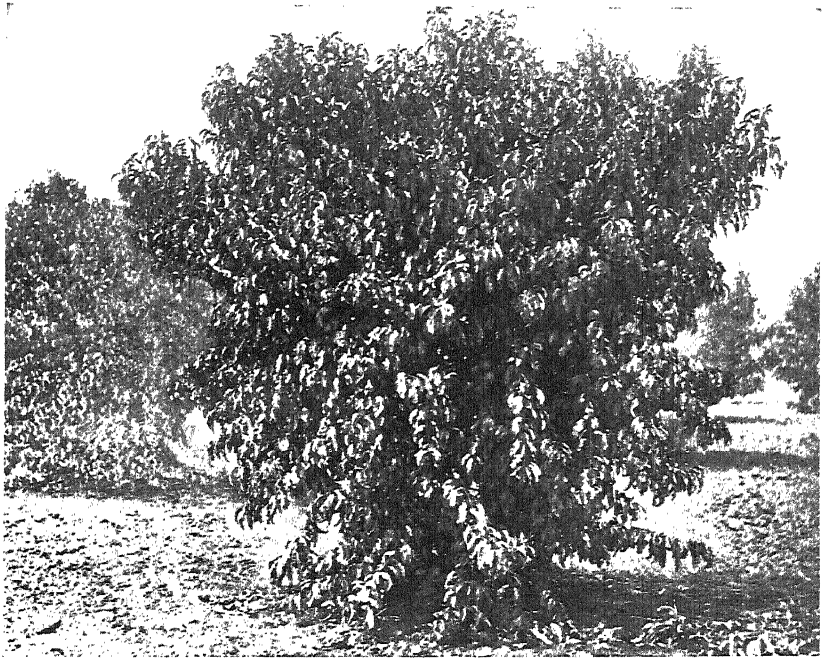
Late varieties of grapes from the Yanco Experiment Orchard were selling this year at from 6s. to 7s. 6d. per case. Estimating the crop at the low average of 200 cases to the acre, 6s. per case gives us a gross return of £60 per acre for late varieties of grapes. Early varieties would sell well, but would not command quite such high prices. Doradillo grapes do particularly well on the area. These may be sold as table grapes, or turned into wine or spirits, for which latter purpose they are worth from £4 to £5 per ton, according to test. They yield from 3 to 6 tons to the acre, according to age, soil, and attention.

Peaches may either be sold to canneries by the ton, or dried; under some conditions they may be sent to the Sydney market to supply the fresh fruit trade. The returns from best varieties grown at the Yanco Experiment Orchard reached £100 per acre this year. Some of this fruit was dried, while most of it was sold as fresh fruit at 6s. to 8s. per case. After trees are four years old they should yield from 3 to 6 tons per acre. Three tons of fresh fruit will produce about half a ton dried at 8d. per pound, or at the rate of £37 6s. 8d. per acre.

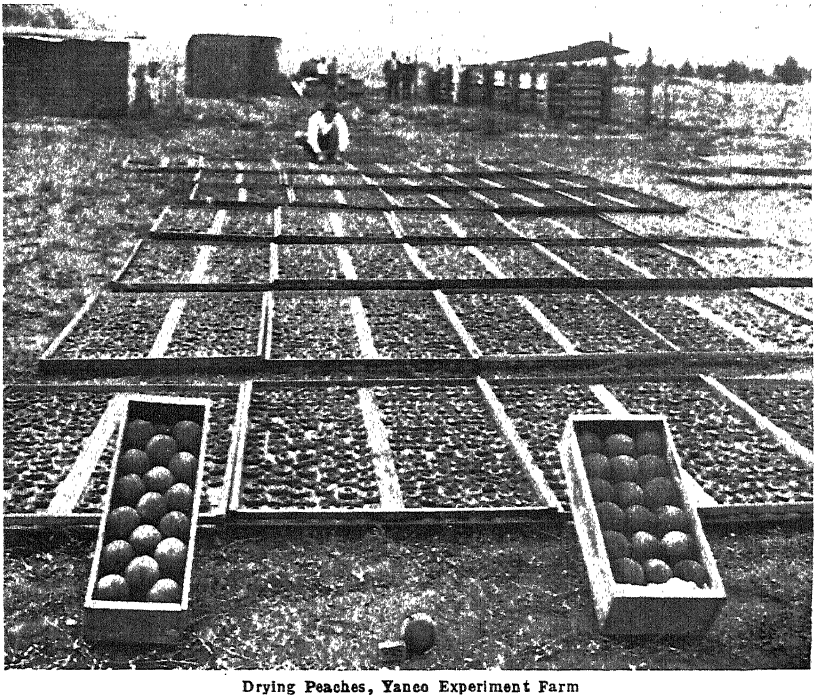
Apricots are doing well on the area, and this year about £40 gross was taken from an acre of 5-year-old trees at the Yanco Experiment Farm.

Irrigating.

Young trees are watered by a rather deep furrow drawn on either side of the row, and as they grow older and larger the number of furrows are increased until there are sufficient to water the whole space. Two furrows between rows of vines are usually sufficient. Whilst trees and vines are young the furrow should be drawn fairly close to the plants, and the water allowed to run until it saturates the soil around the roots, without which the work is not properly done.



Elberta Peach, Yanco Experiment Farm.



Drying Peaches, Yanco Experiment Farm



Walnut Tree, Mayette, Yanco Experiment Farm.



Capri No. 3 Fig, Yanco Experiment Farm.

The common mistake made by beginners is that they very often turn a large head into the furrows and shut it off as soon as it has reached the bottom of the row, and before it has had time to soak into the soil to a sufficient depth to do much good. The result is that the moisture soon evaporates and the young trees or vines begin to show signs of distress and the unskilled grower fancies that the only remedy lies in the application of more water. The best plan is to turn a small head into the furrows and so regulate it that there is sufficient to reach the bottom of the row without any running to waste. It will be found that it requires from 8 to 16 hours for the water to saturate the soil properly. Head ditches should be properly constructed and as soon as possible small sluice boxes inserted in the bank of the head ditch (see Fig. 9) which is a great convenience and assistance in properly regulating the water.

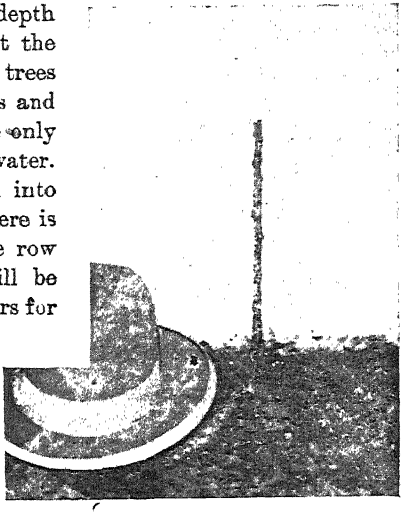


Fig. 6.—The first tree planted under this great irrigation scheme.

While water is running a competent person should be in constant attendance in order to see that the head in each furrow is properly regulated to prevent waste and to make the least amount of water possible do the most good.

Fig. 7 shows a small home-made crowder used for making head ditches (cost about 10s.).

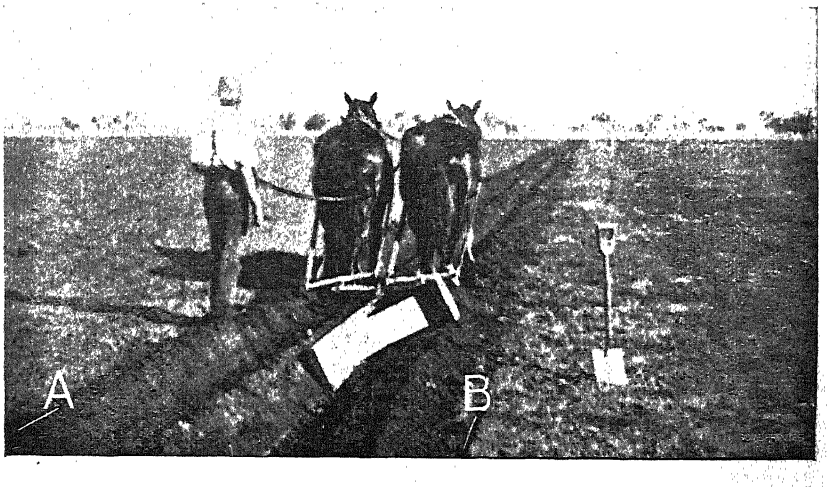


Fig. 7.—Home-made crowder at work making the channels: a handy implement.

Fig. 8 shows a home-made smoother or leveller (cost about 10s).

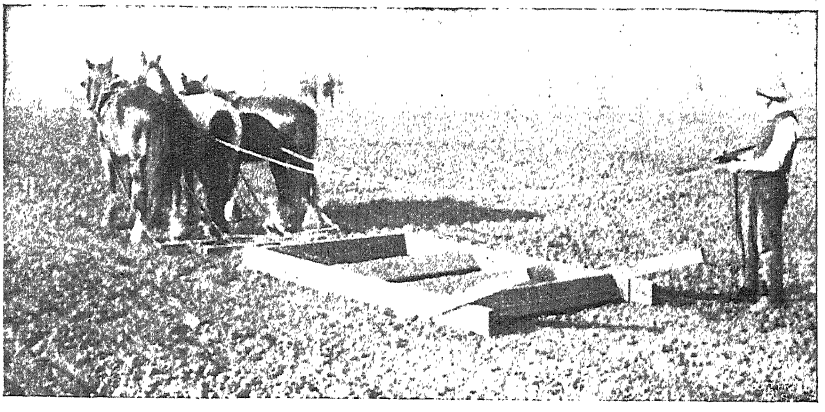


Fig. 8.—Home-made leveller at work; an invaluable implement.

Cultivation.

A soil of good tilth will absorb and hold for the plant the maximum amount of moisture. As soon as the land is sufficiently dry after an irrigation, it should be thoroughly and deeply stirred at least twice, and the young trees or vines well loosened around with a fork hoe, in order to prevent, as far as possible, the loss of moisture.

This can be accomplished by running either a spring tooth cultivator or disc over the surface once or twice, repeating it when necessary, or after rain, as when irrigation is practised it is well to conserve as much of the rainfall as possible, and by so doing avoid the necessity of making so many applications of water.

In addition to the fruit mentioned, strawberries, almonds, olives, walnuts, figs, orange and lemon culture are being tried, and it is anticipated that all of these industries will prove more or less profitable. Tomatoes grow to perfection.

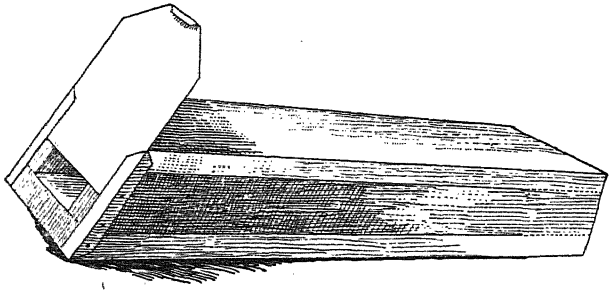


Fig. 9.—Sluice box with regulating slide.

Fig. 10 shows a concrete head ditch with drops inserted when each 9 inch fall occurs.



Fig. 10.—A concrete channel with gauge boards and drops.

In a Bulletin issued by the Department of Agriculture, United States of America, and written by the Irrigation Engineer, information as to the quantity of water required to moisten soil to different depths is given as follows:—

Quantity to Apply in One Irrigation.

What becomes of the water? The application of 4 inches of water in depth over the surface of a field on which plants are growing fairly well is sufficient to moisten the soil to a depth of 4 feet, provided it is evenly distributed without loss. In practice a larger volume is required if it is desired to moisten the soil to this depth. This difference between theory and practice is readily explained. In irrigating in the usual way the top layer of soil receives far too much water. A part of this seeps into the second and third feet, a part passes off in the air in the form of vapour, and the balance remains in this top layer or is utilised by the plants. Now, in this process of distribution from the surface downward there is a large amount wasted. The greatest loss of water is from the surface of moist soil into the air. Thus experiments have shown that if the surface is kept moist for four days after the water is first turned on, from 1 to 3 inches in depth over the surface will be lost by evaporation. If the soil is saturated the loss will approach the higher figure, but if the soil is only moist it will range nearer

the lower figure. There is a further loss of water as it seeps downward. Some subsoils are sandy or gravelly, and the water, instead of being held in the upper 4 feet, may go much deeper and soon pass beyond the deepest roots and be lost. Other fields may have a stiff clay subsoil which will not allow the water to pass through it. The effect of this is to hold the water near the surface until the greater part is evaporated. Considerable quantities of water may be allowed to run off to other fields when they are being irrigated Hence it follows that for light irrigations, where the soil is moistened to a depth of 18 inches, from 2 to 3 inches of water over the surface would be plenty, but so great is the loss from the causes named that 4 to 6 inches are required. Similarly for heavy irrigations and for deep-rooted plants like alfalfa, 6 inches of water over the surface would convert fairly dry soil to moist soil to a depth of 4 feet, providing there was no loss, but on account of the various ways in which water may be wasted the amount required frequently exceeds this.

Cultivation Essential.

In localities where water is cheap and plentiful it may matter little, as regards the annual cost of the water, whether a farmer uses 6 inches at each irrigation or 12 inches. The effect of the proper use of water, however, will soon be apparent in the yield of crops and the fertility of the soil. It should be understood from the start that irrigation water cannot take the place of cultivation. The labour and skill of the husbandman are needed even more in an arid than in a humid climate. Repeated trials have shown that excellent crops of all kinds can be grown with a medium amount of water, provided the soil is well cultivated and the water rightly applied.

Scarlet Nonpareil Apple.

(See Coloured Plate.)

This is a variety which has done well at the Bathurst Experiment Farm, where there is a specimen twelve years old. The date of blossoming in 1912 was 8th October, and of ripening 13th May, 1913, picking taking place on the 5th May.

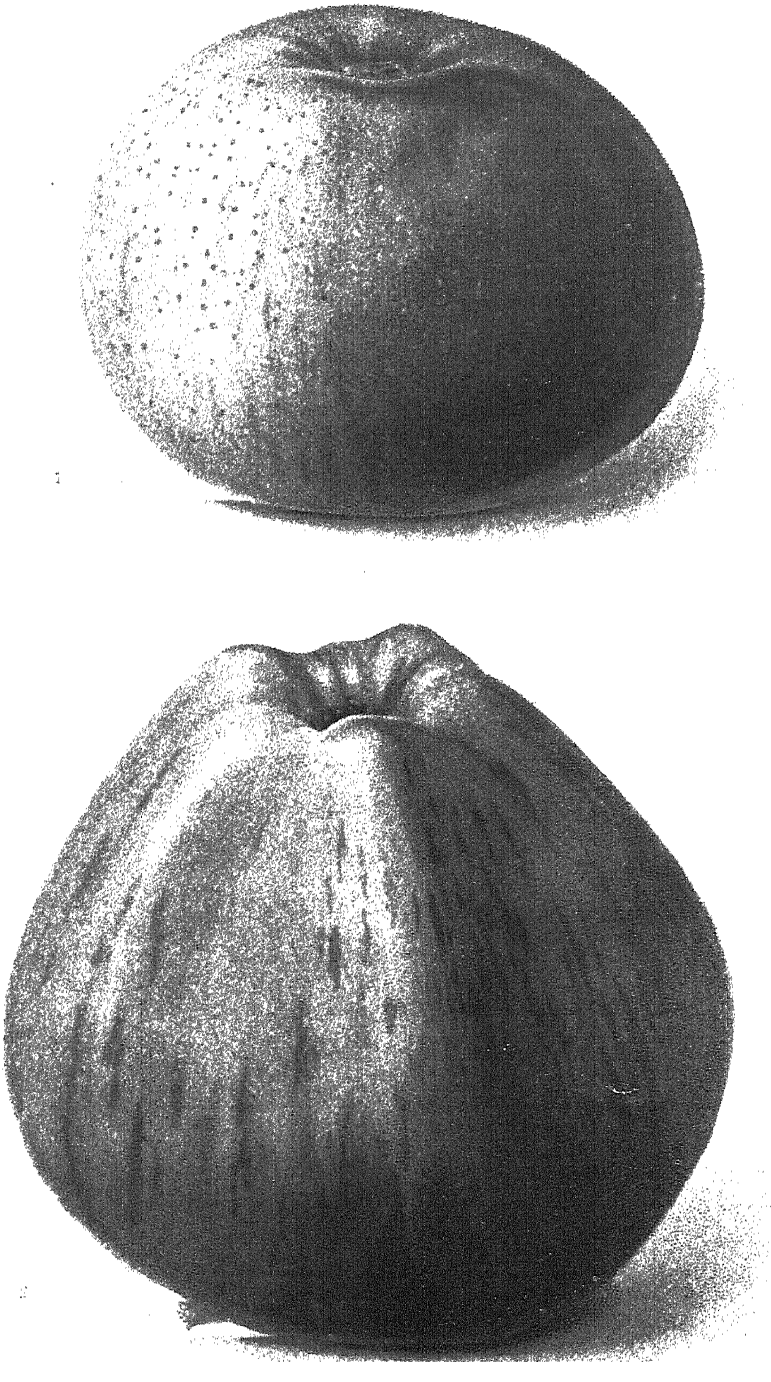
The habit of growth of the tree is vigorous and hardy, though somewhat slender.

The fruit is uniform, roundish, oblate; size, large; colour, whitish, almost covered with a red blush; skin, thick; cavity, deep and narrow; stem, rather long; basin, shallow; eye, open; flesh texture, fine; colour, yellowish white; flavour, good. The variety is sometimes erroneously known as Scarlet Pearmain.

Prince Alfred Apple.

(See Coloured Plate.)

This variety is largely imported into this State from Tasmania, where it is considered good for export as a mid-season apple. Fruit large, elongated, conical ribbed; skin yellow, striped with clear red. Flesh yellowish white; flavour, juicy and rich.



Bacon for Export.

[Continued from page 48.]

E. J. SHELTON,
Pig and Bacon Expert, Hawkesbury Agricultural College.

Main Considerations in Curing.

(a) To retain the natural flesh colour of the meat.
(b) To make the colour even throughout, and as nearly permanent as possible.
(c) To lose as little moisture as necessary without incurring a risk of the meat souring through having too much pickle.
(d) To cure as quickly and as advantageously as possible.
(e) To produce the bacon at the least expense.

(a) To retain the natural flesh colour of the meat.

This is one of the chief aims of the curer, and to enable this to be done especial attention should be given to the purity of all ingredients used; no matter how careful the preparation of the pig and the cure, if the water from which the pickle is made is at all brackish or contains a percentage of iron, lime, &c., the colour of the meat will be affected, and may be almost black in the presence of iron or bleached with the lime. Unless the pig has been properly prepared and bled, and all blood drained from the system, a dark colour will be present in the bacon, which is most difficult to remove.

Too much saltpetre will cause a fiery colour, which shows more clearly as the cure progresses, but which burns the meat and kills the colour when cooked (particularly when boiled).

These are a few of the most frequent causes of loss in colour.

(b) To make the colour even throughout, and as nearly permanent as possible.

If the pig has been well bled, and the materials used in curing are absolutely pure, little trouble will be experienced in the direction of obtaining a good colour.

Temperature and a correct degree of moisture in the curing room are necessary to ensure the salt going into the meat freely, and thus producing an even cure, which, in its turn, should give an even colour. Care in ensuring that no part remains bare of salt (for the export cure is all dry-curing) is absolutely essential. The neck end and ends of the legs where the trotters have been cut off are places that are commonly neglected.

Lumpy salt and saltpetre may cause a spotted meat, one part getting more than its share of the ingredient, another not enough.

A forced colour (usually caused by high temperatures) does not show any permanency, whilst colour that develops comparatively slowly and evenly is generally lasting. A temperature below 40 degrees F. tends to make the

cure too slow, resulting in a loss of colour and an increased risk of taint. Where saltpetre has been used too freely the meat fires as already described. Too little salt, &c., may cause the bacon to be pale when cooked.

(c) To lose as little moisture as necessary without incurring a risk of the meat souring through having too much pickle.

Export bacon carries less salt and more moisture than the ordinary Australian article, but as the meat is not expected to keep long when once it is smoked and sold, there is no necessity for heavier salting and partially drying the meat as is generally done here to ensure its keeping.

When the meat carries a higher percentage of moisture the risk of taint and of souring is greater, so especial care must be taken in preparing and using the pickle. (See preparation of pickle.)

(d) To cure as quickly and as advantageously as possible.

The export meat at Byron Bay and at Kyogle was in salt twelve days, whereas the bacon sold in New South Wales generally takes from three to five weeks' salting, so the capital required for producing export bacon is far less than in the local trade, and so long as the English markets demand a very mild cure there is this decided advantage in exporting. Mild-cured meats are more nutritious than those heavily salted

(e) To produce the bacon at the least expense.

As the cure is so much quicker, and as less ingredients are required in the cure, the expense is reduced considerably, and as previously stated the cost of smoking, &c., is borne by the purchaser.

It should also be remembered that the meat is handled far less than in brine-curing; once the sides are placed in the stack they stay there till the curing is completed, and even from that stage onwards the handling is not a big item.

This system of curing permits of 10 to 14 per cent. more bacon being obtained from the pigs than is at present the rule in New South Wales. Where the Australian curer turns out 66 lb. of bacon, the export article will reach as high as 75 lb. from 100 lb. dressed weight.

We therefore have the following considerations:—

(1) Less salt, saltpetre, &c., than in the local cure.
(2) Twelve days' curing as against twenty-one or even longer.
(3) Less expense in handling.
(4) No smoking to pay for, or loss by drying.
(5) More bacon from a given dressed weight.

And lastly, the pigs most suited for export cure are the heavy bacon types, for which the local factories generally pay 1d. a lb. less. The best English trade demands a bacon made from a carcase ranging from 200 to 220 lb. in live weight, a fact which is wholly to the advantage of the fattener.

The necessity of having only expert men employed is important, as more care (though less labour) is required where the cured product has to compete against the world's supplies.

The factory will always have the advantage over the ordinary farm cure in the matter of expense. Mechanical refrigeration is necessary in producing mild-cured meats, for it is impossible to cure for the London market without absolute control of temperature and moisture.

The consignment, as well as being of the class required, must be properly "got up," otherwise no profit will result.

A recent shipment of East African bacon realised very high prices in the London markets, though it was admitted that the quality of the pig was inferior to the average Australian animal.

Qualifications of a Pig for Export Bacon.

Weight.—200 to 220 lb. live weight, 150 to 160 lb. dressed weight (head, feet and lard attached).

Forequarters—Head, small, with small ears and light jowls, full and wide in the face; *neck,* short and thick; *chest,* thick and full; *fore-feet,* light and small, with fine bone; *shoulders,* strong, not too heavy; *middle piece,* body thick, with well sprung ribs; *flanks,* full, thick, and very deep; *back,* straight, carrying about 1½ inches of hard white fat along the top of ribs; *sides,* long and deep; *loin,* wide and powerful, not drooping. *Hindquarters —Hams,* thick, plump, and meaty down to the hocks; *tail,* set high, not coarse; *legs,* straight, flat bones.

Sex.—Barrows preferred; sows are somewhat risky, as they may be in season, when the meat sours easily. Boars should not be used, as the meat has too strong a flavour, and the cure tends to intensify this.

This type of pig is most popular in that the pig is heaviest and thickest in the most valuable cut, viz., the middle piece, from which streaky rashes are cut, and for which there is a good demand at high prices on the London market. The neck, shoulders, bellies, and gammons are sold at a lower figure, sometimes at a loss. It is from the middle piece, which includes portion of the ham, that the English retailer makes his profit.

The pig, therefore, must have length, depth, and thickness in the middle piece, with lighter weights in the cheaper cuts

Curing.

Curing is really the process of controlling decomposition, and it is not sufficient to merely impregnate the tissues of the meat with a solution of salt, &c., to produce bacon. Certain putrefactive germs are always present in dead meat, and curing is a process of destruction which is partially successful in breaking down some of the tissues of the meat, irrespective of the presence of salt (which is not antiseptic to many of the germs), and in arresting the destruction of other tissues. Hence the flavour of the bacon produced, which is so different from that of fresh pork.

The curing room must be absolutely clean and pure. A certain amount of moisture is required to cause the salt to run well, and thus hasten the cure, and prevent taint.

When the curing is complete there should be little or no free salt on the sides. A brick curing-room, with cement-lined walls, would appear the most suitable. Timber absorbs taints and encourages the growth of moulds.

Advantage of Singeing the Pig.

The Agent-General, in reporting on the recent successful shipment of bacon to London from the Byron Bay and Kyogle factories, states, among other things, that to make the sides quite equal to the best exported from other countries, singeing should be adopted in lieu of scalding. Under the former process, the subcutaneous tissues are solidified, and an improved flavour is imparted. It is also possible to turn the sides out with much more smoothness, which permits of more even smoking. In England and on the Continent the cost of singeing is stated to be seven-eighths of a penny per carcase.

Under the cure now recommended, singeing is not advised in lieu of, but in addition to, scalding.

The object is to remove any remaining hairs, and to make the skin more durable, so that it will not easily slime during the curing process, and to remove a certain amount of the coarse outer skin which is very difficult to remove during the ordinary scalding process.

Singeing would appear to be one of the chief factors for consideration in preparing the bacon for export.

No singeing was practised with the Byron Bay or Kyogle bacon, as no machinery for that purpose was available.

Several small machines are, however, obtainable for the purpose. A coal furnace is the main principle in the most successful machine. The pig is drawn through the flames in a vertical furnace, and left for 15 seconds, and then dropped into a cold-water bath. The gambrels are then inserted in the sinews at the back of the hock, and the pig is hung on the dressing-bars, where it is scraped clean (all black hairs and scurf being removed) and prepared for disembowelling. From this point onwards the process is the same, whether the pig has been singed or not.

The skin of scalded pigs (particularly in hard-cured meats) becomes very tough and dry when cured, whilst that of singed pigs always retains its softness. Singed skins go through the bacon-slicer without any trouble, whilst it is at times necessary to cut off part of the rind of scalded pigs before slicing, or else run the risk of breaking the blades of the machine.

Singed pigs do not slime, because the singeing brings excess of moisture out of the skin, and also fills out all wrinkles, and tightens the skin up, thus reducing the risk of moisture accumulating in the flanks, &c.

The advantages of singeing, then, are; it gives the skin a nice even colour, and the meat a piquant, nutty flavour, retains weight in the side by keeping the skin soft, and the subcutaneous fat hard, makes cleaning easier, and improves old flabby sides. Singed bacon realises the best price in the English market, and even though it is a matter of taste (for Australian bacon, as we know it now, is not singed), yet to compete on even terms with

Danish and Irish we must singe. We still have the great disadvantage that our bacon has to be frozen and then thawed out before smoking; this certainly is a drawback, and one that will always affect the price of Australian bacon on the English market, at any rate until we ship the bacon in a chilled state.

Chilling.

Seeing that the chilling and cooling are so essential in curing, it is desirable that special attention be given to the purchase of reliable refrigerating machinery. The plant should be duplicated if at all possible. In the chill-room the cold air circulation is best; while in the curing-room, cold brine storage is preferable.

A heavy risk is taken in installing ammonia refrigerating pipes in large curing-rooms.

The greater part of the success of the curing depends upon the proper chilling and cooling of the meats, and the maintenance of a constant temperature of 40° to 42° Fah., and a moisture as represented as 76 per cent.

The sides must be cooled slowly. If the temperature is lowered too quickly the outside of the meat becomes quite hard and cold, whilst the internal temperature remains high, and decomposition quickly begins. It is possible that a difference of several degrees may exist unless slow cooling is practised.

During the winter the cooling is easily affected by allowing the sides to hang overnight in an open room, care being taken to see that no flies are present.

In hot weather, place the meat in the chill-room after the animal heat has been allowed to escape, and when the meat is partially set. The room temperature should then be about the same as that of the meat. Now circulate cold air by means of fans placed near either the intake or outlet of the room. Three or four hours should suffice to even up the temperatures. Then the chilling really begins; slowly reduce to 38° F. within about twenty hours. If this is not carefully attended to, taint and souring will be the result. The sides must be kept quite apart from one another in the chiller, and the air allowed to circulate freely through the lines of sides. Extra wide gambrels are necessary for this purpose.

Cutting up and Trimming the Side.

After twenty-four hours in the chill-room, ascertain the temperature of sides by means of a meat thermometer, which should read 38° F., and if this is the case, remove the sides from the chill-room for cutting up.

The sides are now ready for the next process; it will be remembered that the head, backbone, kidneys, and flakes of lard have already been removed; lay the side flesh side up on a flat table or bench sufficiently high to allow of free and easy work, say 2 feet 6 inches. It is necessary to realise from the first that when once meat is trimmed off it is immediately lowered by half or more in value, so the greatest care must be exercised to see that only necessary trimming is done. First remove all blood-stained pieces from near the sticking place in the neck; then remove the tenderloin (that piece

of flesh at the end of the ribs near the loin and immediately behind where the kidney lies). Now cut away the neck bones, together with the top of the breast bone, and either one or two spare ribs. The tops of the ribs are sawn off to make the back appear level with the rest of side, and to prevent one side from injuring the skin of the one laid on top of it in stacking, and also to allow the slats (as described later) to set firmly on the side when weight is put on.

The large blood-vein lying under the first rib should now be exposed sufficiently to allow of part of it being removed, and all blood pressed out of the remaining portion. Scrape all superfluous fat off the flanks, bellies, and lower part of ribs, and any small pieces that may be loose. The blade-bone is now removed. It is essential to thoroughly understand the removal of this bone before attempting it on a side intended for export. We have already noted that after disembowelling, the forelegs are cramped back, so that in chilling and cooling the blade-bone will be set as far forward in the shoulder as possible, thus giving greater length to the middle piece, and making the shoulder much more square and short. It also makes the removal of the blade-bone easier. First work the front trotter freely, and ascertain just where the shoulder joint lies. Then make a deep cut into the joint 3 inches long, and loosen the head of the joint so that the leg works freely.

The blade-bone chisel is now used. This is a long narrow chisel flattened bout $1\frac{1}{2}$ inches at point, and sharpened.

Insert this around the sides of the blade-bone, then on top and underneath; loosen all flesh and sinews, but be particularly careful not to tear the meat at the far end of the blades, as this if torn too much is probably the first spot where decomposition will begin. Now place the blade-bone catcher and strap round your body and grip head of blade. By careful pulling and easing the bone from its position, it will soon come away freely, unless held by some of the sinews the chisel has missed. The pocket-hole is the name given to the place out of which this blade has come. Trim round the pocket as required, always remembering not to make a larger hole than necessary. The head of the hip-joint, called the "aitch-bone," is now removed, and though to the expert the removal of these bones is comparatively easy, to the amateur it is most difficult. Care must likewise be taken in removing the aitch-bone to remove as little meat as possible, as a large hole disfigures the ham and gammon. Saw across the bone leading from the hip down towards the loin, leaving about 2 inches to be taken away. Run the knife right round the bone and underneath until the joint is exposed; then tear the bone away and trim the spot up evenly. Now trim the ham and remove the film or strong muscle spread right over face of ham.

In large pigs the "oyster" bone, which lies in the loin immediately in front of where the tender-loins were cut out, requires to be flattened. Be very careful in trimming the ham not to cut away the "superficial inguinal glands," as their removal may cause the meat inspector to condemn the side on suspicion. Now saw off the front trotter at the first joint nearest the

body; this is best sawn off, as it looks neater, though care must be taken not to cut too close, for the meat may string away from the bone. Hang the side on a travelling hook by the hind leg, which is not removed until the side goes to the curing stack.

Most of the reports already received from England in connection with shipments of Australian bacon refer specially to the fact that the aitch-bone and blades have not always been removed. The presence of these bones in the "Wiltshire cut" reduces its value by several shillings per cwt.

The sides are now removed to the curing-room, where they will even up somewhat in temperature while the balance of the batch arrives.

Lay sides on the pumping table, which should be rather lower than the cutting-up bench, say 2 feet 3 inches high.

Pumping the Sides.

This is without doubt that part of the business which must be attended to by an expert curer, for much trouble will result if the pumping is not properly done. To the uninitiated the process looks simple enough. The curer, however, knows how difficult it is, and yet how important that the needle should be inserted and the pickle forced in the right place.

If too close to the bone, the meat is torn away (for the pickle goes in at high pressure); if not close enough, the action of the salt is retarded, and taint is encouraged. It is difficult to explain the correct position of the needle, and the way in which the pickle is forced in, but in all, seventeen places are touched, seven or eight in the ham, two or three in the fleshy part of the back, and the balance in the forequarter. The flanks and bellies are not pumped. In heavy pigs an extra insertion of the needle is given at the oyster-bone. The pickle pump is worked at 40 lb. pressure, as indicated on the pressure gauge. Attached to the pump is a 4-foot rubber hose, at the end of which is a spring thumb-tap and a perforated hollow needle. The perforations in the needle are arranged in a spiral manner, and it is through these small holes that the pickle is forced into the tissues of the meat.

The density of the pickle used registered 1,210 on the acidometer, and this would be a slightly stronger solution than that registering 100 per cent., or a saturated solution, on an ordinary salinometer.

To moisten them, the sides are now lightly swabbed over with a sash-tool dipped in pickle, then dusted very lightly with a mixture of one part of Douglas's dry bacon-curing antiseptic and three parts of fine granulated saltpetre. This is sprinkled through a pepper-sifter, or other similar tin. On top of this is distributed a heavy layer of medium salt, being careful to place more salt on the thicker and fleshier parts of the sides, and very little on flanks, bellies, and thin portions.

Do not fail to attend to the pocket-hole, with first a dusting of the saltpetre and antiseptic; then fill completely with the medium salt, being particularly careful to force the salt to all extremities of the pocket, otherwise taint will quickly follow. A sprinkle of saltpetre and antiseptic mixture is also to be allowed in the incision made by the meat inspector in cutting into the super-

ficial inguinal glands; a little salt might also be allowed here. A small quantity of pickle is then poured into the pocket-hole to hasten the cure in that region. Dust lightly with saltpetre, &c., under the arm and near the flank in ham.*

The Pickle.

Pickle should be made fresh for pumping.

It is not advisable to use old pickle for export meat, as there is too much risk of taint. All ingredients must be thoroughly tested, and found to be absolutely pure.

The recipe is as under:—

20 gallons of pure rain-water.
56 lb. of salt.
9 lb. of granulated saltpetre.
5 lb. of bacon-curing antiseptic.
3 lb. of black, raw, cane sugar.
1 lb. of glycerine, free from chemicals.
8 oz. refined recrystallised sodium nitrate.

Lymm pure salt and Douglas's bacon-curing antiseptic were used in the bacon recently exported.

First add the salt to 20 gallons of the water, and stir well till the acidometer (at 60° Fah.) reads 1,200, or a saturated solution. If both water and salt are pure, no need exists for boiling. This solution then will absorb no more salt, but its density can be increased by the use of saltpetre; thus a 1,200 saturated salt solution can be increased to 1,225 by the addition of sufficient saltpetre.

When the saturated solution is correct, take 3 gallons of water and dissolve the saltpetre, sugar, and sodium nitrate; when this is thoroughly dissolved, add to the saturated salt solution.

Heat the remaining 3 gallons to 150° Fah., and dissolve the bacon-curing antiseptic; add to balance of solution, and stir thoroughly. The acidometer will now reach 1,210. The necessity of having an instrument that will register higher than a saturated solution is here shown. If the pickle does not register 1,210, add a little extra saltpetre (say 1 lb.). Now place pickle in curing-room to even up in temperature, and when at the same temperature as the room, and just before use, add 40 drops of strong ginger essence, and 20 drops of strong Coriander essence, and stir well.

Stacking the Sides.

Cumberland-cut and Wiltshire-cut meat is stacked with the same object in view, though of course Cumberland cuts are less trouble, as the ham has been cut off. Cumberland cuts resemble our flitches, and are often called "jackets."

*Great care must be taken not to use too much bacon-curing antiseptic, as the law is most rigid on this point. If the bacon, on analysis, is found to contain more than the amount allowed it would probably not be approved of for the export trade. (See Commonwealth Commerce Act.)

The sides are now ready for the stack. On the selected floor space, which should be perfectly clean, sprinkle a layer of coarse salt, and moisten lightly with pickle.

There is every advantage in stacking the sides high (preferably ten sides high) instead of in a long or narrow stack, and as the export cure is all dry curing, stacking is not the least important of the operations.

Possibly one or two stacks will "slip" before the curer becomes properly acquainted with the art of placing the sides in proper position.

The heaviest sides should be placed at the bottom of the stack, preferably close to a wall, flesh side up, with flanks to the wall and backs facing the open room; this is done not only because they "sit" better at the bottom of the stack, but because they may require one or two days longer in salt before they develop the desired rose colour. The lighter sides placed on top cure more quickly, and can be "knocked out" first.

The curing-room should always be kept dark and moist—76 on the hygrometer.

There is no need to touch the sides at all after they are laid down in the stack. All that is necessary is to see that the moisture and temperature of the room are kept as stated, and then the salt should run freely, and the cure proceed correctly. If during the cure any part should become quite bare, it is well to cover lightly with medium salt.

The sides are stacked one on top of the other, and in dry-curing the cure can be hastened or retarded according as the stacking is performed rightly or wrongly. One has to stack so that the salt or pickle will cover every part of the side.

In brine-curing, where the meat is immersed in the brine, the liquid has access to every part of the surface, whereas in dry-curing some parts, particularly the neck ends, under forearm, end of trotter, just under inside ribs, &c., may easily escape getting salted at all unless special care is taken. It is also necessary to see that the stack does not "slip," for if it does, in addition to the meat becoming dirty, valuable pickle is lost, and the cure is retarded, which may be detrimental.

As soon then as the first side has been laid, lay slats of oak on top as follows:—First lay two long slats one on top of the other, on top of rib bones at back and lengthways, being careful that the slat will stay on the ridge of the bones, and not slip into the flesh at the back of ribs. Otherwise it will tear away the flesh, and make an unsightly ridge of bone which will necessitate heavier trimming. Now lay a second pair of shorter slats along the belly at line of teats, being careful that the slats extend on to the sternum or breast-bone in the forequarter, but not as far as the ham in the hindquarter. The slat is laid on the breast-bone to level up the side a little. Now place one short slat diagonally from the belly across the flank to the loin, and another from belly across to shoulder, the idea being that when the next side is laid on top it will rest in such a position that the pickle that forms will run toward the hollow of the ham, and the fore part of the ribs, at the same time draining it away from the belly, flanks and middle ribs.

Now pour half a pint of new pickle in the hollow of the ribs and a small quantity in the pocket hole, and rub a little moist salt at the top of the ribs inside and near where the spare rib was cut out.

Now place the side in position and make sure it rests firmly; the ham in this case should lie on the shoulder of the side previously laid down; follow this routine with all the other sides, remembering to keep all backs outwards from the wall and ten sides high.

The slats or staves should be made only of oak or some other non-odorous wood of the best quality; their size should be (1) 2 ft. long x 2 in. wide x ¾ in. thick, (2) 15 in. x 2 in. x ¾ in.

Soak well in water, then in waste red pickle before use, and change pickle once or twice so as to make certain they are well seasoned, the pickle to be of same temperature as the room. Should any smell be present it would be well to soak them in a hot solution of 1 lb. bacon-curing antiseptic in 1 gallon of water, or 2 lb. bisulphite of lime in a gallon of water, then allow to drain before use, and when finished with, place in pickle again.

It is most important in this warm climate to keep the slats free from mould, or disease of any kind. If no pickle is available, wash them and dry well and stack away in some clean, airy place till required again.

Under these conditions the curing proceeds and the salt as it melts is absorbed and takes the place of the meat juices till at the end of eleven to fourteen days the process is complete, and the sides are ready for knocking out.

It is necessary to keep a strict eye on the stack during this period to see that the salt is dissolving evenly and that the sides are always moist.

The practised ear listens for the continual drip of the pickle as it forms and drops from the side and runs into the drain or other receptacle provided. The temperature of the curing-room should be taken daily, being kept for the first two days at 42° Fah., for two following days 43° Fah., then 44° Fah. for two days, and 45° Fah. for the rest of cure.

In this time the colour should gradually come up from a very pale pink or dull flesh to a light rose or the natural fleshy colour of the meat. The salt should so dissolve that at the end of the period no free or undissolved salt should be noticed. The sides should always be moist. When the period in salt is complete the bacon is "knocked out" as follows:—

First obtain a pointed stick perfectly clean, say, 18 inches long, and open out the pocket hole, force the hand in and remove any surplus salt that may not have dissolved.

If an old pickle pump and a spare piece of hose is available, the pocket can be washed out easily enough by inserting the end of the tube in the pocket and pumping.

The side is now taken by two assistants, turned completely upside down, dropped heavily on a table, then dumped once or twice if the salt does not come away freely enough. As a matter of fact, there should be very little free salt left on the side; it should all have been absorbed if the salt has run well.

The pickle that has formed (called red pickle), and which will run away when the side is knocked out, should be saved and used for storing slats in.

Now place the side in a bath containing a mixture of half pickle and half fresh water, and wash well.

It is bad practice to leave any loose salt on the side, so all holes, crevices, &c., where salt would be likely to escape notice, should be carefully attended to; if not removed it dries white and hard when the side is finally smoked. Care should also here be taken to notice if any taint has developed in the pocket hole or elsewhere. The pocket hole, as previously noted, is a critical spot. Use a medium trier in all thick portions of meat as well as in the vicinity of bones. A large trier leaves a large hole into which flies and maggots will soon find their way, and they quickly set up decomposition. In any case, as the trier is withdrawn the hole left should be closed by pressure of the thumb on the spot.

It is not difficult to detect taint near any of the bones, but experience is required to tell just whether the meat is fit for export or not.

No meat carrying any taint should be baled for export.

Placing the Sides in Draining or Drying Room.

Now stack the sides in the draining room at a temperature of 46° Fah., gradually increasing the temperature during the period to 50° Fah.

The hygrometer should be carefully watched during the draining or drying, as the moisture will be absorbed from the meat if the room is too dry. Keep the instrument at 76 per cent., and if there is insufficient moisture pour a few buckets of pickle on the floor.

The object of placing the meat in this stack is that all surplus moisture is allowed to drain off and the colour evens up nicely.

If in increasing the temperature of the room, which is done to bring up the colour, slime forms on the side, lower the temperature, say, 2 degrees. This will check the development of slime, though it may temporarily check the colouring process. If a bad smell, caused by slime, &c., is apparent, lowering the temperature will also remove this, going as low as 42° Fah., if necessary.

If the sides slime and become "slippy," and lowering the temperature does not have the effect of cleaning them up, they must be taken out of the stack and dipped in a warm solution of, say, ½ lb. bacon-curing antiseptic in a gallon of water. Wash well, and place back in the drying room for a day or two longer. It will be noted throughout the export cure, that absolute control of temperature and moisture is necessary, and a very careful record of all temperatures, &c., should be kept in the engine-room and office log. If this is not done, there will be trouble and possibly unnecessary loss, with a corresponding reduction in the value of the product.

In the whole of the curing, the aim must be to conserve the moisture in the meat, otherwise the percentage of bacon from the dressed weight of pigs will be very low, thus a pig dressed weighing 150 lb., less 25 per cent. head, leaf lard, bones, &c., should give 112 lb. of bacon, or sides of 56 lb. each.

This is only possible by carefully keeping to the recognised rules in the curing.

The sides when being stacked in the draining-room are placed flesh side down, stacking crossways and lengthways, being careful to bind the sides together as much as possible to avoid the possibility of a slip. No slats are used.

The floor must be perfectly clean, and a layer of clean, dry salt is first placed on it.

Lay the heaviest side down at the bottom of stack, all sides back to back, shoulder of one to lie on the ham of the other. Leave in this stack for a week and exclude air as much as possible, keeping the room dark and moist.

At the conclusion of this drying process the sides are removed to the packing-house, where they are baled in the presence of an inspector under the Commonwealth Commerce Act, which requires that such an officer be in attendance some time during the curing process, and if satisfied he approves for export all the meat inspected.

In the course of the inspection, and when the meat has arrived at this stage, a bacon-trier is used along the bones and in the thicker portion of the meat to see that no taint is present. The general "get up" of the sides and their quality is also noted; second-class meat is passed for export, and has a different stamp attached, but it is generally held back for local consumption, as it probably does not pay to export it.

When despatching, a label is attached giving name of the firm exporting, contents of bale, and approval stamp and signature.

In addition to his inspection of the meat and the curing process, the inspector cuts a piece of the meat and forwards same to the Customs Department, where it is analysed to ascertain its freedom or otherwise from preservatives. The law only allows a limited percentage of preservatives in export meat.

Front of ticket.

THE NORTH COAST CO-OPERATIVE COMPANY, LTD.,
Exporters.
Sussex Street. Sydney.

Four sides of Green Bacon, guaranteed free from disease and fit for Human Consumption.

Reverse side of ticket.

COMMONWEALTH. G.R.
Approved for Export.
Australia.

Signature.

Grading.

It is very necessary in exporting to pay particular attention to properly weighing and grading the sides and baling them accordingly. Even though the cure may be right, there is the risk of losing value in badly-graded parcels.

The sides should be graded as near the one weight and quality as possible; thus, four 56 lb. sides should be placed in one bale; not, say, two 56 lb. and two 62 lb.

Bale the 62 lb. sides by themselves, or pack with others as near that weight as possible.

In grading, avoid passing any soft sides, as they do not sell well, and will cause buyers to be suspicious of the quality of the balance of the shipment.

Soft sides will be found difficult to deal with, even in stacking, as they slip easily, and do not firm up in chilling. It would be better to reject them altogether for curing purposes than to run the risk of spoiling any of the other bacon.

If a quantity has come in soft and has to be used, bale separately and invoice as "softs."

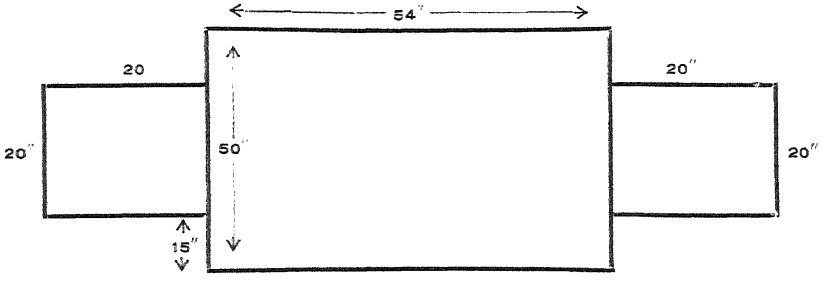
A large quantity of Russian bacon from pigs fed largely on sunflower seed and maize was practically unsaleable when placed on the London market some years ago. It was all classed as soft and fat.

In weighing the sides, and finally marking the weight of the bales, allow, say, 3 to 4 lb. per bale for "beamage," which includes loss in moisture and general loss. The buyers in the old country also allow 4 lb. per bale for rope, bale, &c.

A correct record of the weights should be kept at this end, so that on receipt of the invoice it can be seen exactly what has been lost or gained in weight.

The Bales.

The bales are made of stout open bagging, and are shaped as under:—



In sewing, use very strong thin rope similar to window-cord, though cheaper, and bind the bale well. A well-made bale adds to the value of the product.

Branding.

Each bale should be marked separately and stencilled in a conspicuous place with the number of the bale, the initials or brands of the consignee and consignors, the contents of the bale and the grade mark, as well as the Commonwealth Commerce Act approval stamp.

The bacon from Byron Bay and Kyogle was marked thus: A's, 1 to 10; B's, 1 to 7; C's, 1 to 5; EK's, 1 to 19; K, 1 to 5.

The bales would, of course, be marked differently by other firms, and if required the bacon could be branded as well.

It is suggested that the marks of the bale agree with the code used in notifying the consignees of the despatch.

Thus, A's would signify best quality, and any other remarks required.

B's, best quality lightweights, &c.

A weight tally is now tied to the bale. These tallies were made of a piece of white pine 3 inches long, ¼ inch thick, and were 1 inch wide, and marked as under:—

One Side	E K. , 13.
Reverse	4—2–0–12.

This would signify to the consignees EK (being their mark) that this was No. 13 bale, which contained four sides weighing 2 cwt. 0 qr. 12 lb.

In order to avoid errors it is suggested that the grade mark and number of bale might be placed on both bale and weight tally. The weight tally, when marked, is tied on top of the bale and slipped under the fold of the bagging, so that it is easily obtainable when required by the buyer without untying the bale.

This tally is for the buyer's special use.

Use no Hooks on Bales.

In making shipping agreement, have a clause inserted that the shipping company is liable for damages if hooks are used in handling the bales. Special care must be taken in handling the bale to see that it is not torn or the ropes broken, and it must be kept dry.

Export of Hams.

With reference to the export of hams, it is almost impossible under present Commonwealth Commerce Act regulations to export hams, owing to the necessity of leaving attached that part of the flank in which the superficial inguinal glands are located; in cutting out hams these glands are invariably removed, but as the price realised for hams in England is not usually so profitable as it is in New South Wales, it would not pay to send hams (especially cut) from here. The middle piece is the grocer's cut, since rashers find so ready a sale.

For rolled bacon there is practically no export demand, as the trade is purely a local one, and is fast dying out now that the bacon-slicing machine is so cheap and the flitch so easily cut. The rolled-bacon trade was popular only because the meat was quickly and easily cut with a knife.

Prices of Bacon.

The price of retail bacon in London is never less than 8d. per lb. for good meat. It is common for middles to bring from 1s. 2d. to 1s. 4d. per lb.

At, say, 78s. per cwt. for green bacon, adding 5s. or 6s. for drying, smoking, and preparing for market, it costs 9d. per lb. wholesale; it has then to be cut and sold at a profit.

Prices realised for Dry-cured Bacon from Byron Bay and Kyogle.

In view of the importance attached to the result of these experimental parcels of the New South Wales bacon it is interesting to note that the prices realised have been practically equal to the highest prices obtained on the same market for Danish bacon. The returns have also been higher than any obtained from previous shipments from this State.

The bacon referred to was shipped per R.M.S. "Orama" on 31st August, 1912.

In order to make a thorough comparison, some sides were forwarded cut in the same way as previous shipments, and sold at the same time as the bacon cured under the process outlined. The price for the latter has been from 4s. to 6s. per cwt. higher than that obtained under the old method.

It must be borne in mind that the bacon shipped was made up of weights which were difficult of sale in New South Wales.

The average weight of the "Wiltshire cut" sides in this experimental shipment was 55 lb. 4 oz.

Everybody who sampled this bacon in England was loud in its praises, and if the quality can be maintained (as we are confident it can), it will sell readily in that market at good prices. The price obtained was a notable achievement, when transit handicaps are taken into consideration.

The bacon was distributed in the provincial as well as in the London markets, and expert opinion obtained was very favourable. The bacon opened up in splendid condition, and sold as follows:—Wiltshire cut, 74s. to 78s. per cwt.; Cumberland cut (flitches), 72s. per cwt; Danish, 76s.; and Irish, 80s. per cwt. on same market.

Previous supplies of Australian bacon (not Wiltshire cut) to the London market created the impression that good meat was being spoilt by unsuitable methods. The quality of the meat was everything that could be desired, and once the butchering and curing faults are rectified, the bacon ought to command as good a price as the best Danish or Irish.

The favourable reports on the quality and condition of the meat sent shows that with the adoption of this cure Australian pig-raisers can take equal place with their rivals in Ireland and Denmark. When we consider the

price obtained, and remember that some batches of hard-salted Australian bacon have been sold in years gone by in London for 34s. per cwt., which would not pay for the pig before death, we see the necessity of at once preparing and exporting our bacon in quantity, well got up and cured to suit the taste of the consumer.

An Unlimited Demand.

An English authority states that the home supply of fat pigs cannot possible overtake the demand should the present condition of the trade continue, whilst the possibility of receiving an increased supply of pork products from the United States appears to be remote, since the exports have decreased so plainly during the past few years.

On bacon, hams, and lard, the people of the United Kingdom spend £25,000,000 sterling annually, and the consumption is growing.

It is quite a reasonable proposition, therefore, that Australia should prepare to embark in the systematic export of green bacon to supply this increasing demand.

American bacon exports, as already stated, have fallen 50 per cent. in ten years. A report issued by the United States Government states that the estimated loss of pigs from hog cholera (which is known here as swine fever) during the year ended 1st April last was 6,000,000. This must necessarily reduce the export to England.

It is to be noted that the supply of fat pigs at the principal Western markets in the United States, including Chicago, for the six months ending 1st August, 1912, totalled 12,264,000 against 13,267,000 for the same period in 1911, or a deficiency in number of some 8 per cent. Whilst the average weight of each pig was less, the market value was some 13 per cent. higher than in the previous year.

The present and prospective decrease in the American export trade is Australia's opportunity. Swine fever in Ireland and Russia have brought down the output from those countries; the war in the Balkans also affected the supply, as Bulgaria and neighbourhood are important pig-producing centres.

Faults previously noticed in Australian Bacon.

To ascertain where any faults have been apparent in previous shipments of New South Wales bacon, let us glance at a report that has been supplied to the Honorable the Minister for Agriculture by the Agent-General.

"The quality of the New South Wales bacon is generally very good, though some of it is still too heavily salted for the London market. The bacons from Ireland and Denmark, which realise the best prices here, are only very lightly cured, and, of course, they have to be sold quickly in warm weather. There is no reason why Australian bacon should not be as lightly cured as Danish, seeing that it is brought here in refrigerated chambers."

Demand for Heavier Meat.

It is interesting to note that recently the North Coast Co-operative Company, in their usual monthly report, urged farmers to send in heavier weight pigs. The demand for heavier bacon is on the upgrade, which we attribute to the increase in our population by the immigrants from the United Kingdom, who have a taste for the heavier meat as cured at home.

In general, the value of the two cuts in demand for export proved that the Wiltshire cut is the most suitable, and next in importance comes the Cumberland cut.

The Danish bacon, that has always realised such high prices, does so more as a result of following these methods of cutting up, and by great care and attention given to the curing and get-up, than by anything else.

Bacon Shipping Temperature.

As already stated, one of the chief difficulties we have at present to contend with in shipping our bacon abroad is that the law enforces freezing before shipping; that is, it has to be carried at a temperature not more than 20° Fah., and, of course, it has to be in the freezer a week to come down to this before the shipping companies will receive it.

Were it possible to have the meat carried at a temperature of 28° Fah. to 30° Fah., or even higher, and not frozen so much, the meat would arrive in a very much better state, and not have to undergo the thawing out, which is the worst feature.

To improve matters, it is pleasing to note that a report was recently published, stating that the Comptroller of Customs had consented to an experimental shipment being made for the bacon to be carried at from 28° Fah. to 30° Fah.

This was to demonstrate the advisability of carrying the meat at a temperature calculated to provide for its arrival in England in better condition than at present.

Smoking the Bacon.

The bacon shipped per R.M.S. "Orama" was green or unsmoked bacon, which, after arrival, had to be removed from the bales, dusted over with pea or lentil meal, and hung in the smoke-house for the required period of about seventeen hours. The smoking material is oak sawdust.

In the previous article on the export of bacon, reference was made to the capacity of the Kyogle factory. The manager of that factory states that they are now able to treat a very much larger number of pigs than ever before, and fresh additions are being made to bring the capacity of the factory up to the prospective requirements of the district.

Important.

In conclusion, it is very necessary to emphasise the point that this cure is for export only, and must not on any account be used for the local trade. This is so because the meat is cured for quick sale in a cold climate, whereas Australian bacon is usually cured for storing, and our climate is considerably warmer than that of England and the provinces.

Hélianti.

The introduction of Hélianti, or Helianthi (*Helianthus strumosus*, Linn.), into several countries has not been attended with the success anticipated, and it may be necessary to sound a note of caution with regard to extensive plantings. The brief summary of its characteristics of growth, and the yields in some parts, published in the *Agricultural Gazette*, Vol. XXIII, page 813 (Sept., 1912), sufficiently outlined its ostensible advantages, but so far, except in a few cases, the results have been disappointing.

The claims made that it was remarkable for its enormous production of tubers, and generally luxuriant growth, and that the stems might be used as a fodder, either green, or as hay or ensilage, opened out a vista of usefulness on the mixed farm with which few other crops could compete, and which would ensure a warm welcome anywhere. But these hopes have not been justified.

Tests made in Hungary seem to show that it is less valuable as a forage crop than the Jerusalem artichoke (with which it is closely allied). A recent report states :—

At one experiment station, the yields obtained on a fertile humid clay soil were :—Hélianti, 2,820 lb. stems and leaves, and 4,940 lb. tubers per acre ; and Jerusalem artichokes, 7,410 lb. stems and leaves, and 18,320 lb. tubers per acre. Half of the Hélianti plants failed, against only 7 per cent. of the Jerusalem artichokes ; but even making allowance for this difference, the yield of the latter was greatly superior to that of the former. The inferiority of Hélianti was also demonstrated by pot experiments with various soils. A further disadvantage of Hélianti was found in the difficulty of harvesting the tubers, spades having to be used on account of the long underground runners, while the tubers of the Jerusalem artichokes are close together, like those of the potato, and can be easily harvested with a hoe.

Experiments were also undertaken by various influential Hungarian farmers, and the report in each case as to the value of Hélianti compared with Jerusalem artichokes was adverse. It is concluded that Hélianti may do well in certain circumstances, but that, on the whole, the results which have been ascribed to it had not been obtained.

The Principal of the Hawkesbury Agricultural College, at whose request a consignment of ½ cwt. of the tubers was imported three years ago, states that "similar results were secured at the College in a series of tests extending over three years."

Feeding Bees in Winter.

In reply to a question from a correspondent as to whether it is advisable to feed bees during the winter months, Mr. R. G. Warry, Instructor in Apiculture, stated :—

Bees should not be fed continuously during the winter months, but put into winter quarters, with sufficient stores to last them until spring. If the colony is normally strong now, but short of stores, about 10 lb. of honey can be given it in as few doses as possible, feeding each time as much as the hive will take up. Use a mixture of three parts of honey to one of water by bulk. Stir in boiling water, and feed whilst warm.

If available, use some pattern of inside feeder, preferably the Miller or Alexander. If feed has to be placed in the open it must be liquid enough to allow bees to swim in it, and must have plenty of dry floating material on its surface.

Remove the top supers if empty, and place them under the brood chamber. Use a warm quilt, and narrow the hive entrance.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

RINGBARKING.—"M.J.K.": The most effective time to destroy timber by ringbarking is when the sap is well up—*i.e.*, the period of most vigorous growth. This ranges from late spring to midsummer—say from November to February in each year. In higher elevations ringbarking is sometimes done successfully as late as mid-autumn.—R. D. HAY.

PREPARING LAND FOR IRRIGATION.—"J.P.F.": The land should be cleared of all stumps and roots to a depth of from 15 to 18 inches, then well ploughed and the high places removed with a scoop or other suitable implement. All depressions should be filled in, after which a smoother is run over the land once or twice to make the surface perfectly even. Check banks should then be made about a chain apart; these should be laid out in a direction which gives a fall of from 1 to 2 inches to the chain. This is about the ideal fall, but cannot always be obtained, particularly where land is very uneven. If lucerne is to be grown it should not be sown till the check banks are made and only when the land is moist, either after an irrigation or heavy rain, to enable the seed to germinate quickly. Never irrigate young lucerne until it is well above the ground, otherwise it will be damaged. If vegetables, tobacco, potatoes, or similar crops are to be grown, they should be irrigated through furrows made either with a small horse or hand plough.—W. J. ALLEN.

LICE IN SHEEP.—"R.M.": The only way to eradicate lice in sheep is by dipping. This however is not of much avail when the wool has reached eight or nine months' growth, because the depth of growth makes it difficult to thoroughly saturate the wool, which is necessary in order to permit the specific to reach the skin. Furthermore, when sheep nearly in full fleece are dipped, although the growth is not impaired, the yolk is caused to set and present an unsightly appearance.—J. W. MATHEWS.

PLACING NEW ENSILAGE IN PARTLY-FILLED PIT.—"J.W.D.": In a case where it is desired to put new ensilage in a pit already holding some 20 tons (there being only the one pit), this can be done provided any mouldy or dry silage which is on the top of the portion now remaining in the pit is removed and the possibility of too much moisture reaching the old silage is guarded against.—GEO. VALDER.

SCALE &C., ON CITRUS TREES.—"S.W.T.": This is the Black or Brown Scale (*Lecanium oleae*) and can be destroyed by annual fumigation of the trees with hydrocyanic acid gas under a tent, which is best done in January or February. A spray such as resin wash is also effective. The reddish eggs on the twigs are red mite eggs, which will hatch in spring. Lime-sulphur is the best spray.—W. B. GURNEY.

SPROUTING SEED POTATOES.—"W.H.J.": It has been found that sprouting seed potatoes in a well-lighted room increases the yield and earliness. The explanation for the increase in yield is that the short, thick stem developed under the above conditions bears many scales or leaves in proportion to its height, and it is from the points where these leaves join that the tuber-bearing branches are produced.

Sprouted seed can be planted later than unsprouted, allowing of a longer period after the preceding crop for the preparation of the land. By using sprouted seed the crop can be harvested earlier, this being a big factor in the prices realised when growing the spring crop. Tubers of low vitality can be rejected, and only those showing good, healthy shoots planted, thereby ensuring a perfect stand.—A. J. PINN.

LIMEWASH FOR WATERPROOFING CORNBAGS.—"E.W.": Stone lime, coarse salt, glue, and fat or oil, mixed in the following proportions, will make a good covering for bagging:—Take 10 lb. lime, slacken with boiling water, and strain; then add 1 lb. glue and 1 lb. coarse salt, dissolved. To each 4 gallons of limewash add 1 lb. fat (or oil); stir the whole together, and cover for a day before using. This mixture will keep for at least three months if placed in a cask and covered with a bag coated with limewash.—A. BROOKS.

INSECT EGGS ON LEAF.—"C.J.S.": These have been identified as the eggs of the Green Tree Hopper (*Ecphantodeta pinguis*), and are characteristically deposited in a double row of overlapping eggs on twigs and leaves, the female having a sword-like ovipositor for this purpose. The insects resemble green grasshoppers, and possess elongated hind jumping legs, as well as two pairs of large wings folded over the back. They commonly enter citrus orchards, feed on orange and mandarin foliage, and are sometimes a serious trouble by gnawing the skin of the fruit. They thus cause unsightly and permanent scars, which deteriorate the market value of the fruit, though they do not affect its quality. The wingless young, on leaving the eggs, feed on the leaves, and then resemble ants. Later on they acquire the grass-green colour and wings.—W. B. GURNEY.

Utilising the Water Hyacinth.

THE question of devoting what is now an unqualified pest to a useful purpose is often discussed with the Department of Agriculture in one form or another, and every assistance is afforded in the case of those who are of opinion that they have discovered a profitable method. Quite recently a gentleman placed his views on the subject before the Department, and asked to be supplied with a quantity of the fresh hyacinth for treatment. As a result, the Inspector of Agriculture for the North Coast district was instructed to forward a hundred-weight or two, and in the course of time, three samples of the treated product were submitted for examination. Nos. 1 and 2 were suggested as raw material for making paper, cardboard, &c., particularly No. 2, which was finer than the other; also, it was thought by him that it might answer for engine-packing, insulation purposes, and paper felt. No. 3 was suggested as padding for upholsterers.

The samples were submitted by the Department to two leading paper manufacturers in Sydney, who reported in the following terms:—

No. 1 is useless for paper or cardboard manufacture, as it contains practically no fibre.

No. 2 is also unsuitable for anything but strawboard, and for that purpose sufficient material at a cost of about 10s. per ton, plus cartage, is obtainable.

No. 3 might, perhaps, be used for paper manufacture, but it would have to be cleaned; that is, all threads and knots would have to be removed, and even then the price likely to be obtained would not warrant the expense that would be involved. It must be remembered that in addition to the cost of treating this material, there would be the cost of freight and bales. Both the latter would be heavy items.

Sample No. 3 was submitted to four firms of upholsterers. One firm was inclined to think that it might be used in the very cheapest lines of upholstering, providing it could be placed on the market at a low price; but the others had no hesitation in saying that it would be absolutely unsuitable for upholstering in any form, for the following reasons:—

1st. That it does not contain sufficient body.

2nd. That in teasing it would be practically all reduced to dust.

3rd. That owing to the great quantity of dust it would produce, workmen would refuse to handle it.

Some four years ago a sample of a product obtained from the Water Hyacinth was submitted to some of the leading paper manufacturers in England. They reported that it was absolutely the most inferior substance yet offered to them, as the amount of the fibre was only 4 per cent.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS.

Branch.	Honorary Secretary.
Albury	Mr. J. D. Lankester, Albury.
Baan Baa	Mr. P. Gilbert, Baan Baa.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Beckom	Mr. S. Stinson, Beckom.
Bonville	Mr. H. B. Faviell, Bonville.
Borambil	Mr. H. A. D. Crossman, "Homewood," Quirindi.
Bungalong	Mr. E. Hughes, Oakleigh, Cowra Road, *vid* Cowra.
Cardiff	Mr. F. B. Cherry, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Collie	Mr. C. J. Rowcliff.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coreen-Burraja	Mr. Wm. Stodart, Coreen, *vid* Corowa.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Deniliquin	Mr. W. J. Adams, jun., Deniliquin.
Derrain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Erudgere	Mr. Frank Hughes, Erudgere.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. W. Smith, Henty.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit, *vid* Manilla.
Kellyville	Mr. C. F. Boughton, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S. Stening, Little Plain, *vid* Inverell.
Lower Portland	Mr. W. C. Gambrill, Lower Portland.
Mangrove Mountain ...	Mr. G. T. Hunt, Mangrove Mountain, *vid* Gosford.
Milbrulong	Mr. O. Ludwig. Milbrulong.
Moruya	Mr. P. Flynn, Moruya.
Narrandera	Mr. C. F. Pearce, Narrandera.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
New Italy	Mr. F. A. Morandini, New Italy.
Nimbin	Mr. J. H. Hutchinson, Nimbin.
Orangeville	Mr. C. Duck, Orangeville.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *vid* Penrith.
Parkesbourne	Mr. W. H. Weatherstone, Parkesbourne.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose–Kareela	Mr. L. Pieremont, "Vila," Penrose.
Redbank	Mr. J. A. Graham, Woodlands, McAlister, *vid* Goulburn.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria Streets, St. Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Stockinbingal	Mr. J. Neville, Stockinbingal.
St. John's Park	Mr. A. King, St. John's Park.
Tallawang	Mr. J. E. Hansall, Tallawang.
Taralga	Mr. Dave Mullaney, Stonequarry, Taralga.

Branch.	Honorary Secretary.
Toronto	... Mr. J. G. Desreaux, Esmond, Toronto.
Wagga	... Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla ...	... Mr. H. Smith, Walla Walla.
Walli	... Mr. A. V. Bloomfield, Walli.
Wallendbeen ...	... Mr. W. J. Cartwright, Wallendbeen.
Wetherill Park ...	... Mr. L. Rainbow, Wetherill Park.
Wolseley Park ...	... Mr. H. McEachern, Wolseley Park.
Wyan	... Mr. C. W. Harper, Myrtle Creek Railway Station.
Wyong	... Mr. Edgar J. Johns, Wyong.
Yass	... Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Demonstrations in Clearing Land and Subsoiling with Explosives.

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. H. C. Coggins, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Bee-keeping.

A series of lectures on bee-keeping is being arranged by Mr. R. G. Warry, Instructor in Apiculture. Secretaries, whose branches intend availing themselves of this opportunity to receive a practical insight into this branch of agriculture, are requested to make early application.

NOTES AND REPORTS FROM BRANCHES.

Baan Baa.

A branch of the Agricultural Bureau has been formed at Baan Baa, and Mr. P. Gilbert has been elected Honorary Secretary.

Cardiff.

Mr. J. G. R. Bryant, Assistant Fruit Expert, gave a demonstration of pruning and grafting at Mr. J. Hopkins' orchard, on the 12th June. The trees were pruned so as to start them with a low head, with the main limbs cut hard back. This, it was explained, had the effect of producing good strong trees, capable of carrying a good crop of fruit low down on the branches.

Mr. Bryant also gave a demonstration in the various methods of grafting, explaining the strap and other grafts.

Coonabarabran.

A demonstration of land clearing and subsoiling with explosives was given on the 2nd July by Mr. H. C. Coggins, Assistant Inspector, in the presence of a large number of farmers and others interested.

A large red gum of over 3 feet in diameter was successfully operated on, the gelignite doing the work very well. The huge tree was lifted fully 5 feet into the air, and deposited in a shattered condition well clear of the hole. Everyone present expressed satisfaction with such a quick and cheap method of clearing, especially when applied to big timber.

Mr Coggins gave detailed instructions as to the method employed, and also as to the cost of the plant, gelignite, &c.

Great interest was taken in the demonstration of subsoiling with explosives given at Mr. Moss's orchard. The method seemed to appeal to a large number of fruitgrowers, and Mr. Coggins was kept busy replying to questions and giving advice regarding the necessity of subsoiling certain classes of soils.

The following interesting paper was read by Mr. H. A. Croxon :—

The Best Breed of Sheep for this District.

My object is to explain why the Merino sheep are the most profitable, and the best suited to be grazed in the Coonabarabran district. As is well known, a large majority of the breeders of the State, and more particularly those holding fattening country, are at present breeding cross-bred lambs, with a view to supplying the fast increasing demand for fat sheep and lambs for export to British and foreign markets, as well as for local consumption.

New Zealand is exporting yearly 5,500,000 carcases out of 24 millions of sheep, while Australia is exporting only 3,000,000 carcases out of 95 millions of sheep ; and seeing that there is such a great future for the frozen meat export trade, as people in Great Britain and elsewhere are consuming more and more meat each year, there is great encouragement for the breeders who are catering for the frozen meat export trade to continue their production of cross-bred lambs. I can plainly see, therefore, that in future the breeding of pure Merinos is going to be sadly neglected, and consequently there must be a great shortage of good Merino wool.

I consider that this is practically a wool-growing district, there being very little country suitable for fattening. That being so, there is every encouragement for people holding land in this district to breed and keep for wool-growing a good, plain-bodied Merino of good type and constitution, such as the Wanganella, Boonoke, Burrawang, Egelabra, or Kater Bros.' stud.

The country in this district being mostly ridgy or mountainous, is highly suitable for the breeding and grazing of Merinos.

Owing to the fact of the world's requirements having overtaken the production of wool, and the tendency of prices to rise higher and higher, there is reason to hope that the future for the Merino wool-grower will be a bright one, and I would urge all those who have Merino flocks to keep strictly to the same, and avoid mixing or crossing their flocks.

I would remind all flock-owners of the importance of dipping, as it not only keeps the sheep free from ticks and lice, but nourishes the skin of the sheep, thereby encouraging the growth of wool, as well as giving the staple the bright appearance so necessary to put before the buyers. As to the management of sheep, I would say, do not overcrowd your sheep in yards ; avoid camping in wet yards : do not force ewes through gateways when in lamb ; always be careful not to travel sheep long stages, especially ewes in lamb.

Discussion.—Replying to a question, Mr. Croxon said he was opposed to the breeding of cross-breds in the grazing portions of Coonabarabran district, although he admitted that where large portions of the areas could be farmed, and there was ready access to market, there would be big money in cross-breds.

Mr. Crane considered that cross-breds were worth 2s. per head more than Merinos. Farmers were beginning to realise this, and would soon all be in where the money was.

Mr. Cameron said all farmers near the railway should have crossbreds, leaving it for those in the back country to breed Merinos.

Mr. J. H. Keeping supported Mr. Croxon. As the larger portion of the district was mountainous and very suitable for the growing of fine wools, he did not think it paid the small farmers to breed cross-breds at the present time.

Mr. Hagon endorsed previous speakers' remarks *re* fine wools on the mountain country. Fine wools were going to be scarce and in great demand. Queensland and the back country could not produce fine wools equal to our mountain country. He would recommend all our farmers having only small areas of farming lands to breed fine wool Merinos, leaving those with the larger farming areas and assured rainfall to breed cross-breds for the ever increasing demand for meat.

Dr. Failes thought the subject would bear full discussion, and he would like to see it continued at a future meeting, when Mr. Bowsher's paper on the same subject could be discussed. He questioned if it was really advantageous to go in for cross-breds in this district. Could we produce lambs fit for market in five months without special feeding? There was no comparison between the results of those men with fattening country just outside our district, and those near-by with no fattening country. He did not think it paid in the Coonabarabran district to breed under present conditions; it was only on account of the great cost of stocking up that farmers in the past had tried to breed up.

Mr. Hagon said that to get a lamb fit for market in five months it required not only to be well fed, but the ewe also required to be on good feed for at least six to eight weeks before lambing, otherwise the lamb would not prosper.

Replying to a question, Mr. Croxon said that breeding was not now so successful as in the past when all the flocks were shepherded. He estimated that on average grazing country about 50 per cent. of lambs could be reared.

It was decided to adjourn the discussion to next meeting, and a vote of thanks was accorded Mr. Croxon for his very interesting paper.

Crudine.

Mr. J. W. Mathews, Sheep and Wool Expert, will visit Crudine early in August for the purpose of giving a lecture, and inspecting members' flocks of sheep.

Erudgere.

Mr. C. Pedersen, Dairy Instructor, will deliver a lecture on dairying on the 24th September to members of this branch.

Henty.

A pruning demonstration will be given by Mr. Bryant, Assistant Fruit Expert, to members of the Henty branch on the 27th August.

Inverell.

A lecture on "Common Diseases of Swine" will be delivered by Mr. A. E. Massy, M.R.C.V.S., to members of the above branch on the 4th September.

Katoomba.

At the last meeting of this branch Mr. Charles Wooller read the following paper:—

Interpollination of Fruit Trees.

It has been found in many orchards that about every third or fourth year there is a bountiful crop, while in the intervening seasons there is scarcely more than the average that pays expenses. This subject was being discussed recently at Mr. Scrivener's

orchard, when I paid a flying visit to Mt. Irvine. Mr. Scrivener maintained that the planting of more than one row of either apples or pears has been proved unprofitable, inasmuch as interpollination with too many rows of one kind is uncertain.

To ensure better and constant crops in fruit-growing, the one great factor is the method of interpollination when the trees are flowering. For instance, under the old custom, where several rows of one variety were planted together, it was found that the row nearest to another kind of apple flowering at the same time bore a greater crop than those further away. Consequently, the old method of planting three or four rows of apples or pears of the one kind together should be abolished as unprofitable; and the plan where new orchards are being planted should be to plant alternate rows of different kinds that will flower at the same time, in order to ensure the crossing of the pollen, granting that weather conditions are equal.

With old orchards, where there are too many trees of the one kind, and where it is desired to save the expense of replanting, a graft or bud from another kind flowering at the same time should materially help to fertilise the sterile and non-bearing trees.

Some growers, of course, will maintain that the bee is the principal factor in fertilising. To some extent it is. At the same time it has proved to be very uncertain. The bee may be loaded up from one or two flowers, and away she goes to her hive. Then there are weather conditions that prevent bees from getting about for days and even weeks at a time. I have therefore come to the conclusion that the foregoing method of securing interpollination is by far a more reliable and practicable one, if fruit-growing is to be made a profitable industry.

Another matter that is still in a problematical stage, and should be seriously studied, is the minimising, if not the entire eradication of the fungus and other fruit tree pests, so destructive and expensive to the fruit-growing industry. To my mind, this is a subject that requires a great deal of thought and study.

Kellyville.

The usual monthly meeting of this branch was held on the 5th July, when there was a good attendance of members.

The Secretary brought under notice of members the benefits and conveniences of obtaining books of reference from the country reference section of the Public Library, and forms of application were distributed to those desiring such books.

The discussion for the evening was on the benefit or otherwise of fallowing. Keen interest was manifested in the subject, and several members took part in the debate.

At the next meeting the discussion will be on "Rotation of Crops."

Leech's Gully.

Mr. J. Ditzell read the second part of his paper on mixed farming at the last meeting of the branch.

Mixed Farming.

In order to avoid the use of artificial (commercial) fertilisers, try to keep up your soil fertility by (1) rotation of crops, (2) the application of farmyard manure, (3) ploughing in of crop residues, &c., and (4) the grazing off of crops on the farm as far as it is reasonable, and the marketing of dairy products, wool, mutton, &c., instead of the crop itself. Bear in mind that sheep grazing over a crop will return about 75 per cent. of the plant food in the crop to the soil per medium of their droppings. There is not sufficient attention paid to the conservation and use of farmyard manure in Australia, but as the country becomes more densely populated and intensively worked the matter will receive due attention.

With reference to green manuring. It is a wasteful practice to plough in a green manure crop unless the soil is in need of humus (decayed vegetable or organic matter), because by grazing same off with sheep a monetary return is obtained, and, as before pointed out, about 75 per cent. of the plant food in the crop is actually returned to the soil.

With general reference to the cultivation of the soil, the main principle is to adopt early and thorough ploughing—not necessarily deep, although a moderate depth of about 5 inches should be aimed at. Either mould-board or disc ploughs may be used, according to soil; the mould-board plough is preferred for fallowing (first ploughing), for it will plough harder ground and turn weeds under better, and also leave the surface rougher than a disc plough, which is lighter in draught but tends to make the soil too fine, a disadvantage on hill sides where washing is liable to occur. When a soil is turned up the air and moisture are allowed to penetrate freely, and conditions are set up that are favourable to the beneficial bacteria which convert unavailable plant food into available plant food. One good ploughing is generally sufficient, but the soil should be cultivated afterwards by thin (shallow) ploughing, discing, spring-tooth cultivation and harrowing as desired to conserve moisture; keep down weeds and prepare a good seed-bed for planting, *i.e.*, to get the soil into good heart. The cultivation of the ground after every effective rain is not as a rule essential with black soil, but the weeds must be kept down. Sheep prove useful here.

This brings us to the cultivation and harvesting of crops. When starting on a new farm, exercise every care in the purchase of feed, seed, &c., to keep out black (wild) oats and weeds.

A person running live stock has the choice of the following fodder crops:—Winter: Barley, rye and similar cereals, rape and mustard, &c. Summer: Maize and sorghum, millet (a quick growing catch crop), cowpeas and lucerne.

Wheat and Similar Cereals.—Burning off is an easy and quick method of disposing of the straw, and also destroys some weed seeds and spores (really seeds) of fungus diseases, and the ground usually ploughs up well afterwards. But it depletes the humus content of the ground, and humus is very necessary to preserve the friability and moisture-holding capacity of the soil. Feeding off the stubbles with sheep and then ploughing in is a much better method, by which the humus content of the land is maintained more or less—of course, if a man has a heavy crop of stubble and wants to plant another crop almost immediately, then it is necessary to plough in the straw for obvious reasons.

On small farms where sheep are not kept, and, more particularly, on the heavy soils (a variety which has a wide range in the Inverell district), burning off the straw has not the same harmful effect in the depletion of humus as on the light soils of the district, for the reason that the rainfall is ample, and is fairly evenly distributed throughout the year, which permits a variety of useful plants to grow, and these being ploughed in at the right time assist in the maintenance of a supply of humus in the soil.

Dairying.—This industry has now been established for about eleven years, and has proved a very great success. There is no animal that pays better on the farm than the cow, and where dairying is carried on on up-to-date lines there need be no fear of failure. Then in this connection we have the pig, an animal that does well, and, when run in connection with the dairy, assists materially in swelling the farmer's yearly income.

Discussion.—Mr. Leech said that lime was used very largely in England. Though it was not a manure it had a very beneficial effect on the manures and the soil, rendering the latter much more friable and making the crop hardier. He thought the climate of the district was not so suitable for the rotation of crops as in the Old Country. Clover worked with cereals was excellent there, but he was not sure if it would do here at all. He also mentioned that South Australian farmers were getting glowing accounts of the Inverell district, and he had been asked to verify them, which he was pleased to do in all cases.

Mr. Arkinstall thought the paper prepared by Mr. Ditzell was an excellent one, and the author deserved not only the thanks of the branch, but of the whole district. He was pleased to note that Mr. Ditzell was coming to his way of thinking re humus in the soil, which he favoured more than manure at present. If the local soils were properly worked, especially the black soils, they would take a lot of working out. In connection with the results of the maize plots on his farm, one could gain no idea how much manure was wanted, as the plot sown with 1 cwt. of superphosphate gave a much better yield than the plot manured with 1½ cwt. of superphosphate, blood and potash; 70 per cent. being superphosphate, the balance blood and potash. He thought they had not come to the farmyard manure stage yet. Another good point was the grazing of sheep on certain crops, as they returned at least 70 per cent. in manure to the soil. As far as their district went for mixed farming, there was not a better in the State of New South Wales.

Mr. Maidens thought Mr. Ditzell had taken great pains in preparing his article, as practically every branch of the subject had been fully dealt with.

A hearty vote of thanks to Mr. Ditzell for the trouble he had taken was moved by Mr. Maidens, seconded by Mr. Arkinstall, and carried.

Mr. H. C. Coggins, of the Department of Agriculture, gave a demonstration in land clearing and subsoiling with explosives on the 25th June, on Mr. Lomax's property.

Despite the heavy rain, the demonstration was witnessed by a crowd of nearly one hundred people.

CLEARING AND SUBSOILING WITH EXPLOSIVES.

For the first demonstration in clearing, two stumps, 2 feet 6 inches and 1 foot respectively, were operated on. Holes 2 feet 6 inches deep, at an angle of 45 degrees, were bored under the stumps. These were each charged with eight plugs of gelignite, the holes being interconnected by wires to the firing cable, which, in turn, was connected with the battery. After everybody had retired to a safe distance, the shots were fired. Immediately both stumps were seen in the air, the effect of the shot being very fine. On examination of the spots it was found that nothing remained to be done but to fill in the holes.

Mr. Coggins gave a detailed explanation as to how to do things, including cost, &c.

The next demonstration was in subsoiling, and although it was raining hard, and practically everyone was wet through, the work was proceeded with, and it would appear from the great interest shown that subsoiling with explosives will become a big feature with fruitgrowers in this district.

Mr. Coggins explained the many advantages of subsoiling, what to do and what not to do.

The annual meeting of this branch was held on the 16th June, when the Treasurer submitted his balance-sheet. The election of office-bearers resulted as follows:—President: Mr. A. Mansfield; Vice-President: Mr. J. W. Taylor; Hon. Treasurer: Mr. A. Weir; Hon. Secretary: Mr. J. T. Weir.

Lower Portland.

A social reunion was held by members of the above branch in May—the Sackville branch being represented by five of its members.

At the monthly meeting on the 14th June, Mr. R. Metherill read a valuable paper.

TOMATO CULTURE.

Mr. METHERILL said the tomato crop is one of the most profitable ones to grow, if proper care and attention is given it.

The principal points to be observed for an early market are the raising of plants and the staking of vines.

The hot-bed should be situated in a warm, well-drained situation, with a north-easterly slope, and should be well protected from the westerly winds. In building the bed, a trench 1 foot deep and 4 feet wide, and of the required length, should be dug, and then filled in with heating material, such as fresh horse manure and a quantity of straw bedding, &c. This being well forked about should be tramped down firmly to within 6 inches of the surface of the intended bed. A liberal supply of boiling-water (to start heating) should then be applied, and the soil in which the seed is to be sown quickly filled in. A good supply of well-rotted fowl manure should be mixed with this soil, as it keeps the ground loose, and is a good fertiliser. The seeds should be sown in drills about 4 inches apart—six or eight seeds to the inch—and about ½ of an inch deep. The seed should be covered with a light soil, which must be kept moist with warm water, but must not be made too wet.

When the plants have made the fourth and fifth leaves, they should be transplanted into a larger hot-bed, planting them about 4 inches apart, and a little deeper than their original depth. After transplanting they should be immediately watered with warm water. They should also be shaded from the sun until they have struck root.

This transplanting makes vigorous and sturdy plants for final planting out in the field.

The most suitable land for tomatoes is new land, but any loamy soil with manure will grow tomatoes. It must be remembered that the land must be well drained, as tomatoes will not thrive in wet soil. If the plants are put out early they should be well covered at night to guard against frosts. The plants should be sturdy, and on no account

spindly. It is best to plant towards night, or after showers, leaving as much dirt as possible round the roots. It is also wise to soak the hot-bed with warm water before removing the plants.

When stakes are being used, about 3 feet 6 inches each way is quite sufficient. When the plants are about 15 inches high the first tying should be done; any light material will do for this tie. In tying, care must be taken not to entangle the fruit clusters, or to tie too tight. The second tie should be about 2 feet from the ground, and the third about 3 feet. These should be made of strong cord or thin strips of stringy bark.

The pruning should commence when the suckers are about an inch long.

If early fruit is wanted, leave about five clusters, and top the plant. But if from medium early to late fruit is required, do not prune at all.

Milbrulong.

At the meeting of the above branch held in May, a discussion took place on

HAY VERSUS GRAIN.

Mr. J. RODGERS, in opening the subject, said he considered that growing wheat for hay pays better than growing wheat for grain. An average yield of 30 cwt. per acre, he said, could be obtained, and when it is considered that the price of chaff is £5 per ton in the Sydney market, 30 cwt. per acre should prove a very handsome business proposition.

Mr. J. LYNCH, on the other hand, considered wheat-growing for grain more profitable, and said that a crop of hay which would grow 30 cwt. per acre if stripped, would yield 18 bushels of grain. The cost of producing the hay crop would be approximately 1s. 6d. per acre for twine, 5s. per ton for carting and stacking, 25s. per ton to chaff (including bags), and 13s. per ton freight to Sydney. He considered that the cost of cutting alone would equal that of stripping and carting to the nearest railway station.

Mr. P. J. LYNCH considered that a 30 cwt. crop of hay would not yield 18 bushels per acre, but only 12 bushels per acre, and he was quite sure that hay-growing would pay better than growing wheat for grain.

Several members who took part in the discussion considered that £5 per ton for chaff was too high an estimate to allow. They also pointed out that to grow hay from 1 to 1½ bushels of seed was required per acre, whereas 45 lb. per acre would be ample for grain.

After a further lengthy discussion, the majority of members present decided in favour of growing wheat for grain.

DEPARTMENTAL NOTE.—Mr. H. Ross considers an average price of £5 per ton for chaff in the Sydney market too high, also a 30 cwt. crop of hay, if allowed to ripen and be stripped, will not yield more than from 13 to 15 bushels of grain. The question as to which of the two crops is the most profitable largely depends upon proximity to the railway station and various other local conditions.

Moruya.

A demonstration in clearing land and subsoiling will be given by Mr. H. C. Coggins, Assistant Inspector of Agriculture, at Moruya, on the 27th August.

A lecture on tuberculosis will be delivered by Mr. C. J. Sanderson, M.R.C.V.S., to members of the above branch on the 24th September.

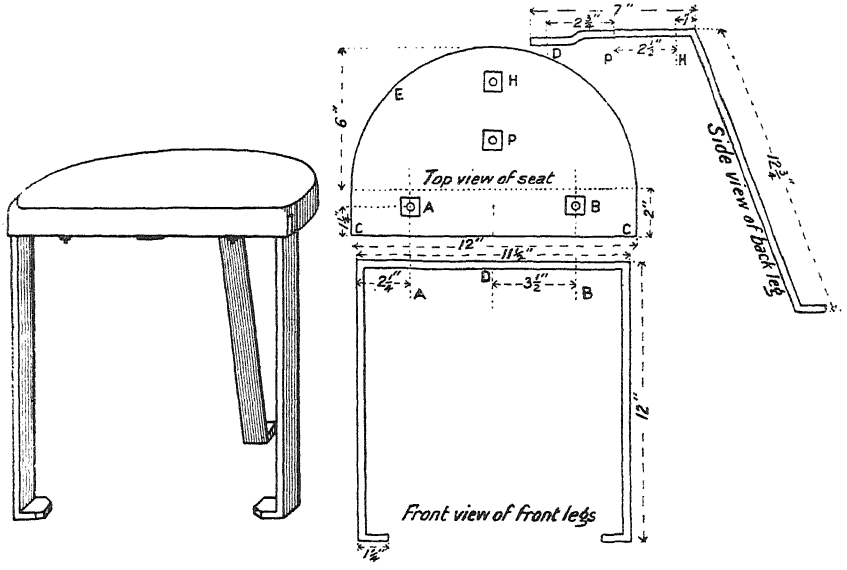
Narrandera.

Mr. C. F. Pearce, Hon. Secretary to the Narrandera branch, has supplied the accompanying illustration of a milking stool made by his eldest son. Mr. Pearce says:—

A USEFUL MILKING STOOL.

Herewith is attached a working drawing of a very strong, comfortable, and durable home-made milking stool, which, I trust, will be of some service, not only to the members of our own branch and district, but also to those on the irrigation settlement at Yanco, and in the dairying industry in the State generally. The stool was made by my eldest son, also drawing; the former on a wet day, and the latter at night-time. As

regards material for making the stool, a piece of common red gum, the more cross-grained the better, is required. The iron work for the legs can be found lying about on most farms. I have used this class of stool for a number of years, and am convinced it will last a lifetime, even with pretty rough usage. At a clearing sale in South Australia these milking stools realised a great deal more than they cost for making, even after doing long years of service.



The ordinary monthly meeting of the branch was held on 19th June when there was a large attendance of members. The President (Mr. C. H. Russell) occupied the chair. The first paper read at the meeting was compiled by Mr. H. M. Devlin, who has had a large experience in poultry breeding. The paper was as follows:—

Poultry Breeding.

I have been poultry breeding for about nineteen years. At first I had White Leghorns, Minorcas, Black Orpingtons, Silver and Golden Wyandottes, American Bronzewing turkeys, and Pekin and Rouen ducks. After a time I sold out of all the fowls except Black Orpingtons and Silver Wyandottes. These I found the best layers in winter, when eggs are scarce. Later on I sold the Black Orpingtons, and kept only the Silver Wyandottes; and I consider these the best all-round fowl for the farmer to keep, for besides being a better winter layer than the White Leghorn, they are a better table bird, not so easily frightened, and a six-foot wire netting will keep them in or out. They are good setters, and good mothers, and, if not wanted to sit, they will lay again in about ten days after being turned off. The only fault I found with them was that they started to lay too soon after hatching, and would leave the chickens before they were quite old enough to do without the mother. From seven hens I had shut in one year I got an average of 185 eggs. Any flock can be improved by using a pure-bred cockerel; but it is better to get good birds for a start, and always get a fresh cockerel from a reliable breeder, and from a good laying strain. Always get a pure-bred male, no matter what you are breeding. After the Silver Wyandotte, I would prefer the Black Orpington for a farmer's fowl. The hawks seem to take more white chickens than any other colour. If you take the three years' test at the Hawkesbury College, you will find the winning pen White Leghorns, won with 480 eggs per hen; Silver Wyandottes came second with 419 per hen, and although the winners laid 61 eggs more than the second pen, the value was only 1s. 2d. in favour of the winners—45s. 6d. and 44s. 4d. In the second year of the test, the White Leghorns laid 162 eggs, value 12s. 5d. per hen, and the Silver

Wyandottes 147 eggs per hen, value 16s. 2d., being 3s. 9d. in favour of the latter, though they laid 15 eggs less. Take April, May, June, and July, the winter months when eggs are scarce, and you will see that the winning pen laid 42, 23, 20, 37, total 122 eggs; while the second pen 54, 78, 57, 77, total 266, or 144 in favour of the Silver Wyandottes.

The PRESIDENT asked when eggs should be set to procure winter layers.

Mr. DEVLIN: July and August.

Mr. A. V. RUSSELL said he had been very successful with fowls. In 1912 he had sold £75 worth of eggs from something over 100 fowls. There was about £15 for cost of feed to be taken into consideration; but to counterbalance that sum he did not keep count of the poultry he used on his table, or the eggs used in the home.

The PRESIDENT said the secret of successful poultry keeping was to cull out the old hens.

Mr. DEVLIN said that the hens should be culled out after their second season.

Mr. Devlin was asked what was the best cure for scales on the legs of poultry. The reply was that a couple of applications of grease and kerosene would be found effective. Personally, Mr. Devlin used castor oil and kerosene. The same preparation was very beneficial in ridding fowls of tick.

A paper on tree-planting was also read by Mr. C. F. Pearce, Hon. Secretary.

Nimbin.

The following interesting paper was read by Mr. J. H. Morrison before members of the above branch.

RHODES GRASS.

About two years ago, hearing of the great value of this grass as a fodder, I purchased 10 lb. of seed to give it a trial. Through not knowing the high germinating qualities of the seed, I sowed (after a fire) about 5 lb. on an acre, and it came away as thick as it could grow. The other 5 lb. of seed I mixed with paspalum, and scattered over somewhere about 15 acres. This would be at the rate of ½ lb. per acre. I have heard it said that paspalum will crush out Rhodes grass, but in this case it has not done so, although the latter was sown so lightly; in fact it appears to be more than holding its own. As to the relative feed-producing value of Rhodes grass as against paspalum, I am of the opinion, after a little more than two years' experience, that land sown with Rhodes grass will carry more stock than will paspalum. It does not require the same great amount of heat and moisture that is necessary to get a good growth of paspalum, and it will outgrow it in wet or dry weather. Another great advantage is that if it is allowed to run to seed, either horses or cattle will eat the whole of it, which, as you are all aware, is not the case with paspalum. Of course, for milking cows the best results would be obtained by keeping it close fed. As I am not dairying I am not in a position to express any definite opinion as to its milk-producing qualities, further than to say that the two or three cows we keep for the house milk splendidly on it. I have been reading of the experiences of other farmers who have tried this grass, and practically all are agreed that if it does not produce any more milk than paspalum, it gives a better cream result, and that is what the dairyman wants. Although paspalum is a splendid grass, and has done so much for this district, I think that farmers are making a mistake by sowing all their land with it. It has been found necessary in the Big Scrub, after ten or twelve years' growth, to plough the land, as the roots have become matted, and consequently the growth deteriorates. Ploughing seems to be the only remedy, and may not be a very great task on level land, but how about the hilly and broken land which comprises the bulk of this district? My idea is that prevention is better than cure, and I would strongly advise landowners who are layirg down new land with paspalum, to mix some strong growing grass with it to prevent it matting. For this purpose, I am of the opinion that there is none better than the Rhodes. It will not only check the spread of the paspalum, but I feel sure will increase the carrying capacity of the land. Of course it remains yet to be proved that the Rhodes will stand the test of years, but in any case it will postpone the day when it will be necessary to break up the land to get a good pasture. Another great advantage of Rhodes grass is that when sown on new land it will germinate and come away with half the rain that is necessary to start paspalum. It grows so quickly that it gets ahead of inkweed and other rubbish, and you will have a splendid crop of grass within three months of sowing the seed, that is, under normal conditions. I have at present 33 acres on which I finished sowing the seed one week before Christmas. Although there is corn planted with it,

the grass is over the fence. I sowed on this land about 2 lb. of Rhodes grass and 10 lb. of paspalum to the acre, but there is very little of the latter to be seen. If I had been depending solely on the paspalum the result would have been a dirty paddock, whereas, thanks to the Rhodes, it will not require any further labour.

Oakleigh.

A veterinary lecture was delivered to members of the above branch on the 9th June.

Parkesbourne.

The first monthly meeting of this branch was held on the 18th June. The Hon. Secretary reports that the branch promises to have a most successful future.

A demonstration in winter pruning was given in Mr. G. Brown's orchard, Parkesbourne, on 3rd July by Mr. J. G. R. Bryant, Assistant Fruit Expert. Favoured by a beautiful day, there was a large gathering of fruitgrowers and agriculturists from the surrounding districts, enthusiasm and interest in the proceedings inducing visitors to travel up to 15 miles. The fifty gentlemen present represented Goulburn, Yarra, Thornford, Wollogorang, Collector, Milbang, Cullarin, Mummell, Merrilla, Pomeroy, Breadalbane, and the immediate neighbourhood.

Before lunch, Mr. Bryant gave some valuable lessons on the pruning of peach and apricot trees.

After lunch, he delivered an address on the aims and advantages of a bureau, such as had been established in the locality. On resuming practical work, his expert attention was devoted to the treatment of Pear trees (Bartletts), Apples (Jonathans), Plums (Grand Duke) and Cherries. The chief points in Mr. Bryant's system appeared to be :—

(1) To train the trees a uniform shape, evenly balanced, with plenty of space for each limb.
(2) To avoid low-branching, which would hinder the work of the team in cultivation.
(3) To aim at the production of as much fruit as possible on the main limbs.
(4) To have the centre of trees clear and open to the sunlight.
(5) To avoid the crossing and chafing of branches.
(6) To produce the fruit right down to the fork of the trees, instead of being confined to the higher branches. This applies to all kinds of fruit.

Mr. Bryant also demonstrated up-to-date methods of pruning grape vines, and subsequently gave practical examples of strap-grafting, &c.

Penrose.

A pruning competition was promoted by the members of this branch, and Mr. J. G. R. Bryant, Assistant Fruit Expert, acted as adjudicator.

Mr. J. James, of Tallong, was the winner, and Mr. V. S James, a son of the winner, was awarded second prize. On the same date Mr. Bryant gave a pruning demonstration at the orchard of Mr. P. Rush, "Sylvan Glen." On the evening following the demonstration, a social evening was held, at which 200 guests were present.

Redbank.

Mr. J. W. Mathews, Sheep and Wool Expert, delivered a lecture in the Redbank Hall on the 18th June, before a fair number of farmers and sheep men generally.

In introducing the lecturer, the President referred to the work of the Department, and also to the opportunities afforded to farmers in becoming

members of the Agricultural Bureau. This was the first visit of an officer of the Department to the district, and they would look forward to meeting other officers, who would speak on different subjects pertaining to the different branches of agriculture, and the best methods applicable to their districts.

Characteristics of Breeds of Sheep and their Suitability to Local Conditions.

Mr. Mathews stated that as a result of his two days' stay in the district, he found that, whilst much of the country was only suitable for the breeding of Merino sheep, there were certain areas particularly well adapted for the raising of Lincolns. Country suitable for the rearing of this class of sheep was limited in New South Wales, and as the district became better known, it should become a very important centre for that purpose. The Lincoln throve best in a cold climate, but required a plentiful supply of good, rich feed. Perhaps no breed of sheep required richer feed, nor did better in a cold climate than this. The best types of Lincoln were usually bred on good volcanic country, and there were to be seen fairly large areas of this class of country in and around Redbank district. Breeders who were fortunate enough to hold these picked spots were advised to go in for the breeding of Lincoln sheep. On the rich soils indicated the farmers' main source of revenue was potato-growing, which, with the breeding of Lincoln sheep, would form an excellent combination, for the class of country and conditions of climate suitable to the one would be equally well adapted to the other.

The demand for good Lincoln sheep was increasing year by year. In its pure state it was neither valuable for wool nor for mutton, but when mated with the Merino it formed one of the most suitable crosses for the raising of the dual-purpose wool and mutton type.

If the breeding of Lincoln sheep received favourable consideration by the local farmers, they would be obliged to resort to better methods of feeding than were generally practised at present. Fodder crops would require to be grown, and they might profitably consider this proposition on the rotation system. Raised in conjunction with potato growing, they might alternate sheep feed with potatoes. Rape and barley formed a good rotation crop, and could be grown in most districts, and Mr. Mathews advised that these crops be given a trial in combination, or that rape be grown by itself. If planted in the autumn and favoured with good seasonable rains, rape would ensure a prompt growth that would supply winter feed, and enable the land to be cultivated and the residue ploughed in for the succeeding potato crop. Turnips afforded a splendid feed for longwool sheep, and they might also consider the advisability of growing these and turning the sheep in on them.

The trial of red clover on the pastures was suggested. This had proved a great success on the tablelands at Glen Innes, and as the conditions were very similar, it might be given a trial. Whatever was done, it would be necessary that more provision should be made than at present in the way of supplying winter feed.

Discussion.—In reply to a question as to which would be the most suitable for raising a five-months' lamb, the lecturer advocated the use of the South Down or Shropshire ram on the Lincoln-Merino ewe, but it would be necessary to supply extra feed before attempting lamb-raising.

During the discussion that followed, it was agreed that lambs raised from Down sires were poor wool types, and would require to be marketed as suckers off their mothers at about the age of five months, or perhaps not later than four months older as weaners.

On the granite country, which differed from the deep red soil country as much as it would be possible for two classes of soils to vary in any locality, the Merino was recommended, and the lightness of the soil and coldness of the climate favoured the fine wool strain.

At the inspections and the demonstrations which were made during the visit, the breeders of the Merino were advised to pay strict attention to the culling and classing of their sheep, the object being to keep the sheep uniform in wool and in conformation, and to maintain a higher standard of class in their flocks. Besides going carefully through their flocks each year and excluding all that were indifferent, breeders were advised to set aside a sufficient amount for the purchase of good sires. It was pointed out that a few extra pounds spent in the purchase of good sires would soon recompense the outlay by the increased return obtained from the flock.

Tallawang.

At the usual monthly meeting of this branch a discussion took place on the destruction of hides by the use of fire brands. A paper was also read by Mr. W. Morgan, dealing with the advantages of farmers running sheep on their farms.

Taralga.

Mr. A. J. Pinn, Assistant Inspector of Agriculture, will deliver a lecture on potato growing to members of the Taralga branch on 18th August.

The following paper was read by Mr. Max Scott, before members of the local branch of the Bureau on the 6th June :—

Fruit-growing.

An industry which is carried out to advantage in many parts of the State of New South Wales is that of fruit-growing. In my opinion the industry does not receive the attention it deserves in this district, as I think the soil and climate of Taralga district should be particularly adapted to the growth of most of the English fruits, especially apples, pears, plums and cherries.

Of course, the distance from a good market is a drawback, but I think an apple orchard well laid out and looked after would amply repay the trouble taken with it.

If the grower only intends to grow sufficient fruit for household purposes, he will only need to plant a small orchard of assorted fruits, but if he wishes to grow fruit for market it would be advisable to plant only a few varieties, that are of good quality, nice colour, and good bearers.

When a farmer decides to plant an orchard, he should be particular in selecting only the best land and situation available. Low-lying land should be avoided, on account of the frosts and the difficulty in draining if it becomes necessary. It is as well, also, to avoid planting on steep hillsides or uneven ground, as there would be more trouble owing to the soil washing away, and there would be more difficulty in cultivating and handling the crop. If possible, an orchard should be planted so as to take advantage of a natural breakwind, such as green timber or high ground, but in the case of clear country a breakwind of pines or other ornamental trees should be planted at the same time.

Apples, pears, plums, and other English fruits, do well where the land is sloping gently toward the east or north, as they get the benefit of the morning sun and escape the westerly winds.

In choosing varieties it is best to select those that carry well and sell well, as in the event of much fruit being produced the grower will have to depend on the export market. An intending grower would do well to have a look around the district where he intends to establish an orchard, and find out which kinds do well. Such apples as Five Crown, Nick-a-Jack, Snowy and Granny Smith grow well about here, and are also very good sellers.

Planting operations should be carried out early in the winter in this district—about the month of June. The trees should be planted about 20 or 25 feet apart, so as to allow each tree to have sufficient soil, and also to permit of cultivation. The holes should be dug 2 or 3 feet deep, and the subsoil well worked up, so that the roots can spread out well.

When planting young trees it is not necessary to leave roots any longer than 6 or 8 inches, and all bruised or broken roots should be cut away. One person should hold the tree in an upright position, while another fills in the moist surface soil about the roots, which should lie in a natural position. Trees should be planted when the ground is in good order and easily worked.

When fruit is to be marketed it should be picked before it is properly ripe, and great care should be taken that it is not bruised or marked in any way, as, of course, it would not then sell as well as clean, sound fruit. In packing, only specimens of uniform size should be put in the case, and it is better to make two or three grades, as fruit of all sizes mixed together does not appear to advantage.

Walla Walla.

The demonstration of land clearing and subsoiling with explosives, given by Mr. H. C. Coggins, of the Department of Agriculture, on the 9th July,

was attended by over 100 people, many of whom came some distance to be instructed in the use of explosives as applied to agriculture.

Mr. Coggins, in the course of his remarks, referred to the soil of the district as being admirably adapted for subsoiling, but under no circumstances should the work be carried out during wet weather or after heavy rains, as the ground would "pug," and no good would result.

Mr. Coggins gave demonstrations both in clearing and subsoiling, but as the majority of those present attended principally to learn something about subsoiling, greatest interest was shown when Mr. Coggins subsoiled an apricot tree of forty years' growth. The effect upon this tree will be closely watched by all present.

Wolseley Park.

A paper, entitled "The Primary Clearing of Virgin Land," was read by Mr. E. Woodhouse, and was afterwards discussed, at last monthly meeting.

Clearing Virgin Land.

Mr. Garner said he had been informed that if trees were rung in August they would not throw suckers.

Mr. E. Woodhouse said that the timbers peculiar to this district were prone to sucker when rung, regardless of the time of the year.

Mr. R. Logan stated he had seen cases in which the suckers had been knocked off the stumps for four years, and still the stumps were alive.

Mr. E. Woodhouse stated that in the method he advocated suckering twice would generally suffice to kill the stump.

A discussion ensued between members on the merits of the forest devil *versus* a Trewhella jack for hauling down timber.

Mr. Garner asked if the average green timber in the district could be pulled down with a forest devil.

Mr. E. Woodhouse said it could, and quoted a local instance to prove it.

Mr. T. Bagust asked if a Trewhella jack was as effective as a forest devil in green and large timber.

Mr. E. Woodhouse said it was not.

The general opinion of members was that for clearing green timbered land, or land that had only recently been rung, the forest devil was the most efficacious, but for clearing land of timber dead for many years, the Trewhella jack would prove the best.

In reply to a question, Mr. H. McEachern said it was advantageous, when pulling down green timber with the forest devil, to cut the surface roots. When the tree fell, if this had been done, the butt would rise out of the hole; on the other hand, if the surface roots had not been cut, the butt would bury itself, and would therefore be extremely difficult to remove. A plan that could not be too highly commended was to place a log of wood about 1 foot in diameter, 3 or 4 feet from the butt of the tree, and on the side to which it was to be pulled. When the tree fell, the log so placed would have the effect, even in most obstinate cases, of bringing the whole butt well above the ground level, thereby greatly facilitating future operations when burning or removing.

In clearing land for the plough, when covered with green timber in its natural state, Mr. H. McEachern said he had had some experience. The method employed was to first go through with a mattock and take out all the small undergrowth up to about 3 inches in diameter. This done, the next thing was to remove all saplings and any small timber that would not warrant the use of the forest devil. This could be accomplished best by using a horse fastened to a log with a rope attached. The saplings should be loosened with the mattock and the rope fastened as high as possible without danger of snapping the trunk. When the horse pulled, the intermediate log kept the pull down and prevented jerking, the result being a steady, even strain. The large trees were pulled down last. After the timber had lain for twelve months, a fire would burn up all the rubbish and small wood. The logs were then cut and rolled together and burnt, the running of the roots and filling in of the holes being the final operations.

Mr. H. McEachern was requested to give his experience in ringing and scrubbing. He said the method that gave the best results and was most practical, was to frill-ring all timber, large and small alike down to 3 inches in diameter at any time of the year when most convenient, but preferably during the summer and autumn months. In

the following autumn, any time between 1st March and 31st May—not later, if possible—go through the rung timber with the mattock and grub out (making sure to get well under the bulb) such undergrowth as had not been rung and the seedlings, at the same time knocking off all the suckers on the larger timber. The next year, go through again in the autumn, and mattock out any seedlings (which would be very numerous where there were many large green trees), and knock off the suckers, of which there may be a fair proportion. The following year a very small percentage of the trees would be found living, but if the land was again gone over in the autumn, the most obstinate timbers of the district would succumb to the work. When frill-ringing, care should be taken to meet each cut in the wood; if this was not done the ring was very apt to grow over. Where the work was let by contract, and the men were either not experienced or unreliable, chip-ringing was the best because it could not be easily slummed. Mr. McEachern strongly condemned the practice of cutting down scrub and burning. If a good burn could be obtained, the scrub might be killed, but the trouble was to make sure of a good burn. After a bad burn the scrub generally grew more vigorous than ever. The greatest objection he had to burning was the extent to which it damaged the land. On the hills where the scrub always grew thickest, the land was poorest and the humus scanty. When this class of land was fired all the humus that had taken years to deposit was burnt off and the natural grass with it, the result being bald, bare ground. Of course the landholder had the satisfaction of seeing his land cleared of timber, especially rubbish, but he had no grass left, and none would grow for many years to come, if ever. He had proved that where the same class of land had been rung, mattocked and suckered, a good coat of grass would appear and remain established, thereby increasing the stock-carrying capacity. The small sticks, leaves and rubbish when left to decay helped to create more humus, and did not leave the great bare patches that remained on the ridges after a hot and what is generally termed "successful burn." In the years that followed, any grass that grew on the burnt hillside was only good for a short time during the spring, disappearing as if by magic when the hot weather came. Of the two methods described, Mr. McEachern said, when the burn was successful—and in this locality it very often was not—cutting down and firing was cheaper at first cost than ringing and suckering, but at the end of, say, five years, the man who rung, mattocked and suckered his land, leaving the rest to nature, came out on top every time. Another objection cited in connection with burnt land, was the erosion which followed heavy rains, washing away any plant residues that might make humus, indeed, in some cases the erosion was so considerable as to leave the land permanently barren.

Mr. BAGUST asked if suckering would be quite as effective if done every second year instead of annually.

Mr. H. MCEACHERN said it would not. A great many men, he said, made that mistake. The longer the suckers were allowed to remain on the stumps after the seasonable time had passed, the stronger the stumps would become, and therefore the harder to kill—in some cases requiring to be suckered once, twice or even three times more than would have been necessary had the work been done annually.

Mr. GARNER asked if the stumps drew nourishment from the suckers.

Mr. MCEACHERN said the stumps developed in comparison to the suckers. When the suckers were kept in check the roots would sicken and die.

Mr. MCEACHERN was asked why suckering in autumn was preferable to other times of the year. He replied that when the work was done before the autumn the stumps would generally sprout within a few weeks. By suckering in the autumn, climatic influences prevented all growth until the following November. Supposing the work was done in March, the stumps would be deprived of leaves for eight months of the year, a strain the most obstinate timbers could not long withstand if repeated.

Mr. T. MCAULIFFE asked if Mr. McEachern preferred frilling up or down?

Mr. MCEACHERN: "Down, by all means." It was much easier for one thing, and another point in its favour was the retention of rain-water inside the ring, which damaged the stump to a certain extent. If the cuts were directed upwards the water would be shed. By giving the axe an upward jerk as each blow was struck, the bark in many cases was capable of being loosened several inches or more below the ring, thereby exposing a greater portion of the stump to the elements.

Mr. MCAULLIFFE said when burning logs a lot of labour was entailed in stacking. He asked if rolling into a pit to burn would be any easier, quicker, or cheaper.

Mr. E. WOODHOUSE said he thought where there was a market for charcoal the pit system of burning would be profitable to a certain extent. Charcoal, he said, was worth 2s. 6d. per bag.

ANNUAL REPORT.

The first annual report of this branch was presented at the last meeting. It mentioned that during the year ten meetings were held, at which a number of papers were read by members, and four officers of the Department of Agriculture had visited the district to lecture on various subjects. Steps had been taken towards framing the coloured illustrations of insectivorous birds which have appeared in the *Agricultural Gazette*, with a view of hanging the pictures in the Mechanics' Institute. Samples in the grain and sheaf of nineteen varieties of wheat, four of oats, and six of barley had been received from the Department, and a collection of plant specimens had been started with fourteen varieties of useful grasses and twenty-four of fodder plants and weeds. These had been forwarded to the Department for identification and returned with their respective names attached, and a statement as to their value as fodder or worthlessness as weeds. The branch during the twelve months of its existence had grown to be numerically the strongest in the State, there being 116 financial members.

Wyong.

Mr. J. G. R. Bryant, Assistant Fruit Expert, gave a demonstration in pruning, and an instructive lecture to members of the Wyong branch. Despite the fact that the day was a wet one, the audience numbered forty.

A lecture on veterinary subjects is being arranged for the 22nd September.

WHITE ANTS IN ORCHARDS.

WHITE ants are difficult things to deal with in an orchard, as poison that will kill them will also affect living plants. When planting, care should be taken that all damaged roots are cut clean away. As regards deep planting, if the scar of the graft is covered with the soil, we often find that white ants attack this spot and gain a foothold on the young tree. Thus deep planting is a mistake if it brings the scar underground.

Care should be taken to remove all stumps and bits of dead wood from ground intended for an orchard, as these tend to harbour the pests. Where the ground is kept well worked round the trees, white ants seldom do any damage. When they are found about the roots of a fruit-tree a few pounds of Kainit dug in will drive them away, and also act as as manure.—W. W. FROGGATT.

TREATING MILK FOR TOWN SUPPLY.

THE proper method of treating milk for town supply is that of cooling immediately after milking. No other method except that of pasteurising should be allowed. If cold water is available, the milk should be cooled thoroughly as soon as possible after milking, by passing over an ordinary milk-cooler, and it should then be held in a cool place until delivery. If this is done there should be no difficulty in sending sweet milk to market at this time of the year.

In the summer, unless some very cold water is available, it will be necessary to heat the milk to about 165 degrees or 170 degrees Fah., and then cool it by the aid of cold water, as soon as possible afterwards, in order to deliver it sweet twelve hours after milking.—M. A. O'CALLAGHAN.

Orchard Notes.

W. J. ALLEN.

AUGUST.

WINTER spraying should be commenced with the lime-sulphur solution, which is both an insecticide and a fungicide. The 15-15-50 mixture has been used with great success at the Wagga Experiment Farm Orchard. Keep a sharp outlook for aphis on peach-trees. Resin and washing soda, tobacco-wash or Nikoteen will be found useful to keep this pest in check. Also keep a sharp lookout for the appearance of woolly aphis and mussel scale, and should any trees be found affected they should be carefully pruned, removing and burning as many of the infested twigs as possible. Spray thoroughly with red oil emulsion.

Keep all fruit-packing sheds as clean as possible, as there is no doubt they are responsible for harbouring a great many moths every year.

Growers who intend using quick-acting fertilisers should make the first application this month. It is better not to apply too much at one time, but rather make two applications—one now, and one after the fruit is set. In the drier districts, where late rains are uncertain, it is better to make the application earlier than late, as it is well known that they do not give the same results if applied when the soil is at all dry.

The latter part of this month is a good time to start the grafting of deciduous nursery stock, and should there be any unprofitable apple, pear, or other trees standing in the orchard, these also may be grafted to good varieties.

All ploughing should be completed, and the space not touched by the plough well chipped.

Green manures should be ploughed under, so that the plant-food locked up in them may be available when the tree requires it to mature its fruit. If the green crop is left too late, moisture, which can ill be spared if the summer is a dry one, is lost.

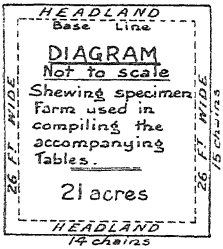
Plant young citrus trees.

Samples of Fruit.

I have to acknowledge with thanks the receipt of some very fine specimens of the "Yates" variety of apple, from Mr. T. Hewson, senior, of Ashbank Orchard, Penrose. This variety does particularly well in the neighbourhood of Penrose, and in other tableland districts of good rainfall.

Mr. Fruit-Inspector O. Brooks forwarded some very fine specimens of citrus fruit from the Gosford district. These afford a further proof of the suitability of the conditions of that locality for this class of fruit.

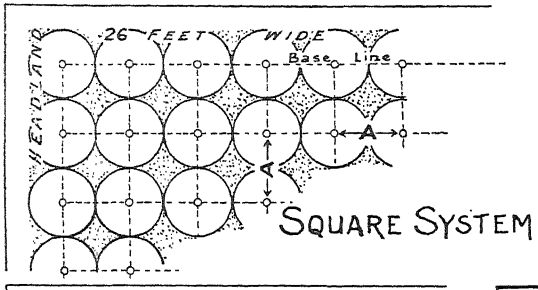
The accompanying table shows the number of trees per acre and the percentage of waste space under various systems of planting and at different distances apart. It will be noted that while the "square" and "alternate" systems average from 20 to 23 per cent. of waste space, under the "septuple," "hexagonal," or "equilateral triangle" system, the waste space is reduced to one half of this amount. The diagram was supplied by the manager of the Murrumbidgee Irrigation Trust.



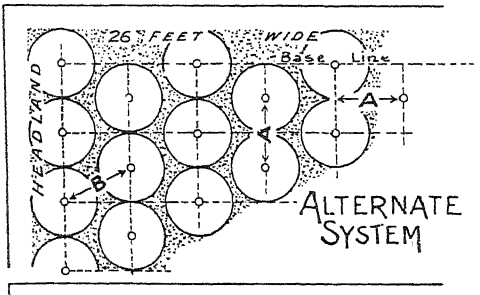
DIAGRAMS

Shewing methods of Setting out orchards & Tables shewing number of trees per acre & percentage of waste space for different spacing

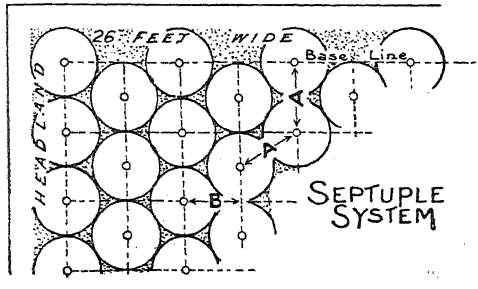
Notes:- Trees shewn by small circles
Root space shewn by large circles
Waste space shewn by dots, thus:-



A Feet apart	No of Trees per acre	Percentage of waste space
20	100	22·8
21	92	21·8
22	82	23·7
23	78	20·8
24	70	22·8
25	65	22 4
26	60	22·7
27	56	22·3
28	51	22·2
29	48	23·5



A Feet apart	B Feet & inches apart	No of Trees per acre	Percentage of waste space
20'	22' 4"	100	22·8
21'	23' 6"	92	21·8
22'	24' 7"	82	23·7
23'	25' 8¾"	78	20·8
24'	26' 9"	70	22·8
25'	27' 10⅝"	65	22·4
26'	29' 0"	60	22·7
27'	30' 1"	56	22·3
28'	31' 2¼"	51	22·2
29'	32' 2¾"	48	23·5
30'	33' 6"	45	23·4



A Feet apart	B Feet & inches apart	No of Trees per acre	Percentage of waste space
20	17' 4"	118	8·9
21	18' 2"	104	11·7
22	19' 0½"	95	11·6
23	19' 11"	86	12·7
24	20' 9½"	80	11·8
25	21' 8"	74	11·7
26	22' 6"	70	9·8
27	23' 4½"	63	12·7
28	24' 3"	58	11·5
29	25' 1½"	55	12·4
30	25' 11½"	52	11·5

STALLION PARADES FOR SEPTEMBER AND OCTOBER, 1913.

Date.			Place.	Time.
Monday,	1	September	Warialda	2 p.m.
Tuesday,	2	,,	Bingara	3 p.m.
Thursday,	4	,,	Inverell	2·30 p.m.
Wednesday,	10	,,	Gulgong	11 a.m.
,,	10	,,	The Horton	10 a.m.
Thursday,	11	,,	Mudgee	10 a.m.
,,	11	,,	Barraba	Noon.
Friday,	12	,,	Rylstone	10 a.m.
,,	12	,,	Manilla	10 a.m.
Monday,	15	,,	Liverpool	10·30 a.m.
,,	15	,,	Penrith	11 a.m.
,,	15	,,	Wollongong	2 p.m.
Tuesday,	16	,,	Gundagai	10 a.m.
,,	16	,,	Luddenham	10 a.m
,,	16	,,	Kiama	10 a.m.
,,	16	,,	Dapto	4 p.m.
Wednesday,	17	,,	Adelong	2 p.m.
,,	17	,,	Nowra	10 a.m.
Thursday,	18	,,	Tumut	2 p.m.
,,	18	,,	Denman	10 a.m.
Friday,	19	,,	Merriwa	Noon.
Monday,	22	,,	Camden	Noon.
,,	22	,,	Wyong	11 a.m.
Tuesday,	23	,,	Milton	10 a.m.
,,	23	,,	Crookwell	11 a.m.
,,	23	,,	Raymond Terrace	2 p.m.
Wednesday,	24	,,	Moruya	10 a.m.
,,	24	,,	Gunning	11 a.m.
,,	24	,,	Lithgow	2·30 p.m.
Thursday,	25	,,	Yass	10 a.m.
Friday,	26	,,	Cobargo	10 a.m.
,,	26	,,	Burrowa	10 a.m.
Saturday,	27	,,	Bega	10 a.m.
Monday,	29	,,	Gosford	11 a.m.
,,	29	,,	Bombala	11 a.m.
Tuesday,	30	,,	Taralga	Noon.
,,	30	,,	Tenterfield	11 a.m.
,,	30	,,	Cooma	11 a.m.
Wednesday,	1	October	Goulburn	10 a.m.
,,	1	,,	Glen Innes	10 a.m.
Thursday,	2	,,	Braidwood	10 a.m.
,,	2	,,	Guyra	10 a.m.
,,	2	,,	Adaminaby	9·30 a.m.
Friday,	3	,,	Queanbeyan	10 a.m.
,,	3	,,	Armidale	9·30 a.m.
,,	3	,,	Uralla	3 p.m.
Saturday,	4	,,	Walcha	2 p.m.
Wednesday,	8	,,	Moss Vale	10 a.m.

Government Stud Bulls available for service at State Farms, or for lease.

Breed	Name of Bull	Sire.	Dam.	Stationed at—	Engaged up till
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (im.)	Wollongbar Farm	*
,, ...	Imperialist ...	Florio	Lady Nancy of Minembah.	,, ,,	*
,, ...	March Pansy .	Earl March	Australian Pansy	Grafton Farm ...	
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
,, ..	Thessalian II. ..	Thessalian (imp.).	Egyptian Princess (imp.).	,, ,,	
,, . .	Elaine's Heir ...	Thessalian II ...	Wagga Elaine	Yanco Farm ...	*
,, ...	Royal Blood ...	Berry Melbourne	Calceolus ...	Wollongbar Farm	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie ..	Berry Farm ..	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Wagga Farm ...	*
Guernsey .	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Kyogle	22 Dec., '13.
,, ..	Star Prince ...	Calm Prince ...	Vivid (imp.)...	,, ...	5 Mar., '14.
,, ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Maclean	2 Dec., '13.
,, ..	Prince Souvia ...	Vivid's Prince...	Souvenir(imp.)	Grafton ...	31 Dec., '13.
,, ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Wollongbar Farm	†
,, ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '13.
,, ...	Sunshine ...	King of the Roses	Princess Vivid	Grafton Farm ...	*
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	Claudius (imp.)	Golden Star II..	Claudia's Pride(imp.).	Tweed River ...	18 Aug., '13
,, ...	Trengwainton VillageFavourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
,, ...	Good-bye ...	Western Duke...	Souvenir (imp.)	Wollongbar Farm	†
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Jones Island ...	31 Dec., '13.
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (im.)	Bega	1 Dec., '13
,, ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Wollongbar Farm	†
,, ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel(imp.).	Murwillumbah ...	10 Nov., '13.
,, ..	Prince of Warren Wood (imp.).	Kingsmoor Governor (1952)	Quail (7051)	Macleay River ...	1 Dec., '13.
,, ..	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Frederickton ...	14 Dec., '13.
,, ...	Rosehill (imp.)..	Northesk (2073)	Faultless Footsteps (6132)	Raymond Terrace	19 Sept., '13.
,, ...	Duke of Orleans	Godolphin Arthur (1664)	Flower of the Preel 3rd (imp.)	H.A. College, Richmond	*
Ayrshire ...	Jamie's Heir ...	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm	*
,, ...	Orphan Boy ...	Songster of Greystanes.	Rosamond ...	Glen Innes Farm..	*
,, ...	Wyllieland ... Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A.College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin(imp.)	Bratha 4th ..	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

* Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.

Department of Agriculture,
Sydney, 2nd August, 1913.

BULLS FOR SALE

AT WOLLONGBAR EXPERIMENT FARM.

GUERNSEY.—**Earl of Bath:** sire, Monsieur Beaucaire; dam, Miss Jasmine; calved 10th December, 1911. Price, **£35.**

AT BERRY EXPERIMENT FARM.

JERSEYS.—**Ladas:** sire, Berry Melbourne; dam, Lally Optician; calved 11th November, 1911; colour, whole fawn. Price, **30 guineas.**

Lally Optician is by Sir Jack from Bellona. Bellona was by Optician (imp.) from Pattibelle (192). Pattibelle (192) was by Lily's Boy (imp.) from Claribelle (imp.)

Sir Jack is by Omelette's Pride from Lady Tidy 3rd (imp.).

Omelette's Pride was by Lucy's Pride from Rum Omelette (imp.).

Lucy's Pride was by Melbourne (imp.) from Miss Lucy 3rd (imp.).

Lally Optician gave 4,177 lb. of milk on her second calf, testing 6·2 per cent, equal to 299 lb. of butter last season.

Bellona gave 4,362 lb. of milk, testing 5·9 per cent., equal to 304 lb. of butter.

Foxtail: sire, Xmas Fox (imp.); dam, Bellona; calved 24th April, 1912; colour, whole fawn. Price, **20 guineas.**

(Bellona's breeding is shown above, also milk yield.)

GUERNSEYS.—**Belfast:** sire, King of the Roses (imp.); dam, Flaxy II; calved 20th September, 1911; colour, lemon and white. Price, **40 guineas.**

Flaxy II is by Rose Prince (imp.) from Flaxy (imp.). Flaxy II's only record is 3,333 lb. of milk, testing 5 per cent. (in 1911), equal to 197 lb. of butter. Flaxy (imp.) in 37 weeks gave 6,443 lb. of milk, producing 334 lb. of butter.

Haymaker: sire, The Peacemaker; dam, Hayes Muzette 7th (imp.); calved 5th January, 1912; colour, lemon and white. Price, **40 guineas.**

The Peacemaker is by Calm Prince from Rose Petersen.

Calm Prince is by Rose Prince (imp.) from Gentle (imp.).

Rose Petersen is by Peter (imp.) from Rose Petal. Rose Petal is by Rose Prince (imp.) from Saucy Sal (imp.).

Hayes Muzette 7th (imp) in 1911 yielded 5,620 lb. of milk, testing 4·6 per cent, equal to 304 lb. of butter.

AT COWRA EXPERIMENT FARM.

JERSEY.—**Shakespeare:** sire, Sir Pat; dam, Leading Lady; calved 13th January, 1912; colour, whole fawn. Price, **20 guineas.**

Leading Lady is by Berry Melbourne from Lady Tidy 4th.

Lady Tidy 4th was by Golden Lord from Lady Tidy 3rd (imp.).

Berry Melbourne is by Melbourne (imp.) from Rum Omelette (imp.).

Sir Pat is by Sir Jack from Pattibelle (192).

Leading Lady, on her first calf, yielded 3,346 lb. of milk, testing 6 per cent. equal to 237 lb. of butter.

BULLS FOR SALE—*continued.*

AT WAGGA EXPERIMENT FARM.

JERSEY.—Aitua's Lad : calved 14th June, 1911, No. 238 ; sire, Kaid of Khartoum. Price, **£25.**

Dam, Wagga Aitua, A.J.H.B., 787, by Colleen's Golden Lad, A.J.H.B., 119.
G.D., Wagga Ranee, A.J.H.B., 793, by Coral's Lad.
G.G.D., Wagga Empress, A.J.H.B.,785, by Neat Lad.
G.G.G.D., Maggie, by Lucius King.
G.G.G.G D., Jessie, by Well Done.
Kaid of Khartoum, by Sir Jack, from Egyptian Belle.
Coral's Lad, by Mabel's Prince (imp.), from Coral (imp.).

MILK YIELDS.

	lb.	Test.
Empress	6,293	4·2 per cent.
Ranee (first calf)	4,642	4·6 ,,
Aitua	4,466	5·2 ,,

HOLSTEIN COWS FOR SALE.

BERRY EXPERIMENT FARM.

Name.	Date of Birth.	Sire.	Dam.	Price.
				£
Lolkje Field (in calf)	12 Nov., 1904 ...	Garfield	Lolkje	20
Marjorie (in calf)	5 Sept., 1906 .	Chairman	Margaretha ...	30
Fraulein Arama (in calf) ..	4 Feb., 1907 ...	The Hague ...	Dina's Douwe ...	25
Marigold (in calf) ...	25 Feb., 1907 ...	The Hague .	Margosa	25
Maggie Hague (in calf) ...	28 Aug., 1907 ...	The Hague ...	Maggie Obbe ...	30

GEORGE VALDER, Acting Under-Secretary.

A SUBSCRIBER has called attention to the fact that certain illustrations have appeared in the *Agricultural Gazette of New South Wales* that are not suitable for children to see, and has in consequence requested that the journal should not in future be forwarded to him.

As the *Agricultural Gazette* is a purely technical publication, intended to assist the farmer and stock-owner in every possible way, it is obvious that in certain cases references should be made to, and illustrations given of, such matters as assistance in calving and foaling, lamb-marking, castration, &c.

While these essential principles should be grasped by the farmer himself' there are serious objections to the custom of allowing children to see the illustrations or read the articles. The insertion of the advice given by a qualified veterinary surgeon, with its explanatory diagrams, was obviously designed to afford a ready means of reference by which the lives of stock might be saved and serious loss obviated.

Readers are therefore reminded that in some cases it may be desirable to glance through the contents of the *Gazette* before allowing children to see it.—ED.

Trials of Rice Seed.

The two early varieties of rice, grown without irrigation, forwarded by the Director of Agriculture of the Central Provinces of India, have again been tried at Grafton Experiment Farm. The two imported varieties, "Paddy Nasik" and "Paddy Raskaddum," were sown with Upland rice for comparison, on a red volcanic loam which had been fallowed the previous winter. Four rows of each variety were sown on 4th January, 1913. The seed was soaked over night, and sown the following morning, being dropped by hand into shallow drills, 60 yards long and 30 inches apart. The rainfall from sowing to flowering was 7·48 inches.

"Upland" matures a full month earlier than the other two varieties, flowering in the middle of March, while the others did not reach that stage until the third week of April. Germination was good, and all varieties stooled out very well. After-cultivation consisted of several hand-weedings and horse cultivation.

One row of each variety, 40 yards long, was cut at the same stage of growth for the estimation of green stuff, yielding at the following rate per acre:—"Upland," 2 tons 1 qr. 9 lb.; "Paddy Nasik," 2 tons 5 cwt. 4 lb.; "Paddy Raskaddum," 2 tons 7 cwt. 1 qr. 15 lb.

The remaining three rows were allowed to mature, then seed, and a length of 50 yards was stripped when ripe. "Upland" was stripped three times at an interval of three weeks, it being very irregular in ripening. The yield per acre was 3 cwt. 15 lb. Neither of the other two matured any seed, probably owing to the approach of cold weather.

A further trial will be made on alluvial soil, as it is thought that under these more natural conditions more satisfactory data can be obtained.

AGRICULTURAL SOCIETIES' SHOWS.

Secretaries are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1913.

Society.	Secretary.	Date.
Forbes P., A., and H. Association	... J. H. Bates ...	Aug. 19, 20
Murrumbidgee P. and A. Association (Wagga)	... A. F. D. White ...	,, 19, 20, 21
Corowa P., A., and H. Society	.. John D. Fraser ...	,, 26, 27
Gunnedah P., A., and H. Association	... M. C. Tweedie ...	,, 26, 27, 28
Barmedman A. and H. Society...	... P. H. Sheehan ...	,, 27
Parkes P., A., and H. Association	... G. W. Seaborn ...	,, 27, 28
Ariah Park P., A., H., and I. Association ...	... J. N. Taylor ...	Sept. 2, 3
Wellington P., A., and H. Society	... A. E. Rotton ...	,, 2, 3
Grenfell P. and H. Association...	... G. Cousins ...	,, 2, 3
Manildra P. and A. Association	... C. M. Podmore ...	,, 3
Germanton P., A., and H. Society	... J. S. Stewart ...	,, 3, 4
Junee A. Association	... T. C. Humphreys..	,, 3, 4
Young P. and A. Association	... T. H. Tester ..	,, 9, 10, 11
Albury and Border P., A., and H. Society ...	... W. I. Johnson ...	,, 9, 10, 11

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1913.

Society.	Secretary.	Date.
Moama Agricultural and P. Association ...	A. E. Bartlett ...	Sept. 10
Cootamundra A., P., H., and I. Association ...	T. Williams ...	,, 16, 17
Cowra P., A., and H. Association	G. S. Fisher ...	,, 16, 17
Ganmain A. and P. Association	J. F. Ashwood ...	,, 16, 17
Murrumburrah P., A., and I. Association ...	J. A. Foley ...	,, 23, 24
Canowindra P., A., and H. Association ...	G. Newman ...	,, 23, 24
Riverina P. and A. Society (Jerilderie) ...	J. Kennedy ...	,, 24
Burrowa P. A., and H. Association	W. Burns... ...	,, 25, 26
Hay P. and A. Association	G. S. Camden ...	,, 30, Oct. 1
Yass P. and A. Association	W. Thomson ...	Oct. 1, 2
Millthorpe A., H., and P. Association ...	C. J. E. Hawken...	,, 7, 8
Hillston P. and A. Association	S. J. Gordon ...	,, 8
Crookwell A., H., and P. Society (Spring Show)	H. P. Levy ...	,, 10
Balranald P. and A. Society	A. Malcolm ...	,, 15
Tweed River Agricultural Society (Murwillumbah)...	A. E. Budd ...	Nov. 12, 13

1914.

Albion Park A., H., and I. Association ...	M. A. Brown ...	Jan. 14, 15
Kiama A. Association	G. A. Somerville...	,, 23, 24, 26
Wollongong, A., H., and I. Association	W. J. Cochrane ...	,, 29, 30, 31
Berry Agricultural Association	S. G. Banfield ...	Feb. 4, 5
Alstonville Agricultural Society	C. D. McIntyre ...	,, 11, 12
Guyra P., A., and H. Society	P. N. Stevenson...	,, 17, 18, 19
Gunning P., H., and I. Society...	J. R. Turner ...	,, 18, 19
Dapto A. and H. Society	J. H. Lindsay ..	,, 24, 25
Inverell P. and A. Association	J. McIlveen ...	,, 25, 26, 27
Uralla A. Association	H. W. Vincent ...	Mar. 3, 4, 5
Tenterfield P., A., and M. Society	F. W. Hoskin ...	,, 3, 4, 5
Tumut A. and P. Association	T. E. Wilkinson...	,, 4, 5
Central New England P. & A. Association (Glen Innes)	George A. Priest...	,, 10, 11, 12
Coramba District P., A., and H. Society ...	H. E. Hindmarsh	,, 11, 12
Tumbarumba and Upper Murray P. and A. Society...	E. W. Figures ...	,, 11, 12, 13
Bangalow A. and I. Society	W. H. Reading ...	,, 17, 18, 19
Armidale and New England P., A., and H. Assoc'n.	A. McArthur ...	,, 17, 18, 19, 20
Camden A., H., and I. Society	C. A. Thompson...	,, 18, 19, 20
Goulburn A., P., and H. Society	G. G. Harris ...	,, 19, 20, 21
Crookwell A., H., and P. Society	H. P. Levy ...	,, 26, 27
Cooma P. and H. Association	C. J. Walmsley ...	April 1, 2
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins ...	,, 1, 2, 3
Royal Agricultural Society (Sydney)	H. M. Somer ...	,, 7–15
Bathurst A., H., and P. Association	J. Bain	,, 22, 23, 24
Tamworth P. and A. Association	J. R. Wood ...	,, 28, 29, 30
Orange A. and P. Association	W. J. I. Nancarrow	,, 29, 30 May 1
Northern Agricultural Association (Singleton)	E. J. Dann ...	,, 29, 30, May 1
Clarence P. and A. Society (Grafton)	G. N. Small ...	May 6, 7, 8
Hawkesbury District A. Association (Windsor)	H. S. Johnston ...	,, 7, 8, 9

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VOL. XXIV. SEPTEMBER 2, 1913.

Agricultural Gazette of New South Wales.

The Pastures of New England.

E. BREAKWELL, B.A., B.Sc., Economic Botanist.

A FAIR amount of work during the past few years in the laying down and stocking of pastures, and in experimenting with grasses and forage plants, has been done in the New England district, both by the Manager of the Glen Innes Experiment Farm and by prominent pastoralists. A certain amount of unanimity has been arrived at with regard to the profitable cultivation of some grasses, while there is still a difference of opinion about other grasses.

Some points of practical and theoretical interest may now be worth discussion.

Introduced Grasses.

The principal English and other introduced grasses which have been tried in New England are as follows:—

Italian and Perennial Rye (*Lolium Italicum* and *Lolium perenne*).
Cocksfoot (*Dactylis glomerata*).
Kentucky Blue (*Poa pratensis*).
Texas Blue (*Poa arachnifera*).
Timothy, or Cat's Tail (*Phleum pratense*).
Bromus inermis.
Phalaris bulbosa.

Perennial Rye Grass.

Some excellent Perennial Rye pastures may be seen right throughout the New England district. The custom at Glen Innes Experiment Farm has been to sow the seed broadcast with red clover (the latter seed being sown in a direction at right angles to the grass seed). The ground is worked to a fine tilth before sowing and rolled without harrowing after sowing. A mixture of 20 lb. of rye and 10 lb. of clover per acre is recommended by the manager as being perhaps the best proportion.

Perennial Rye at Glen Innes Experiment Farm.

At the Farm the grass made little growth in winter, and is just lightly touched by frost. It makes most of its growth in the spring. If the summer is dry and hot, it is hard hit, and a large amount is killed out. The most beneficial practice at Glen Innes in utilising it as a pasture has been to feed it off lightly before it is twelve months old in order to prevent it running to seed, and after this time it can be stocked heavily. The grass stands pasturing well, being little affected by the trampling of stock. The Perennial Rye pasture shown in Fig. 1 has been stocked, on and off, for seven years,

as many as two sheep per acre being run on it for eight months. During this time it has received no top-dressing nor treatment of any kind. The grass has a good aftermath, if not allowed to seed freely; but, in order to thicken the stand, it is a wise course to allow the grass to seed every three years. The grass is a favourite one with sheep, is sweet and fairly fattening, but not as nutritive as Kentucky Blue or some of the other introduced grasses. The nutritive albuminoid ratio of a sample from the Farm was as 1 : 8·7. It compares favourably with any other introduced grass, with the exception of *Phalaris bulbosa*, but it does not hold the ground quite as well as Kentucky Blue.



Fig. 1.—A Perennial Rye pasture, Glen Innes Experiment Farm.

Other Experiences.

There is a decided aversion on the part of many pastoralists to lay down Perennial Rye to cultivation on account of the fact that it is killed out by a period of continuous dry weather. A glance at Fig. 10, showing the root system of the grass, will indicate the poor hold the grass has on the soil. Mr. F. C. White, "Saumarez," Armidale, after carrying out the cultivation of this grass for some time, abandoned it on account of its weak drought-resisting qualities. Perennial Rye grass is one of the best grasses on low, marshy meadows. Many pastoralists have done well with it under these conditions. Mr. Giles Moore, Guyra, has a stand of it eight years old. It is situated in a low, marshy position on his estate, and is now thicker than when first established. No pastoralist should hesitate to establish a stand of this grass in low-lying situations. It produces an abundance of seed, soon arrives at maturity, and is relished by stock.

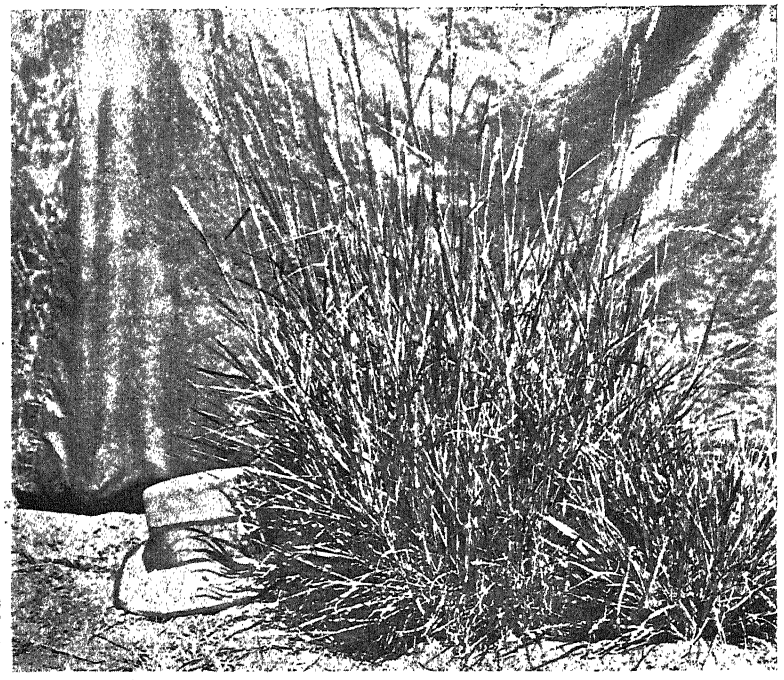


Fig. 2.—A clump of Perennial Rye, Glen Innes Experiment Farm.

Kentucky Blue Grass.

This famous American grass has done particularly well in that country on soils rich in lime. Spillman, the American agrostologist, writes:—"Were it not for its habit of remaining dormant during the dry, warm months of summer, the length of time required to secure a good stand of it, and its comparatively low yield of forage, it would leave nothing to be desired of it." This appears to be the experience with this grass in New England, to which, however, might be added its tendency in favourable seasons to spread on to cultivated lands. The experience of the Manager of Glen Innes Farm with Kentucky Blue has been as follows:—The pasture has lasted seven years with stocking. It has taken possession of the ground better than Perennial Rye, but is affected by dry weather as much as, if not more than, the latter. Under favourable conditions the grass will stand a good deal of stocking, and is a favourite pasture grass with sheep. It is rather backward in becoming established, fully twelve months being required before it is fit for even light stocking.

Other Experiences.

Many pastoralists object to this grass (1) because it spreads into cultivation areas in favourable seasons, and (2) because it is slow in becoming established, and grows slowly after being cut or grazed. The root growth of Kentucky, with its numerous spreading "suckers," is particularly adapted

to "running." There is no doubt, however, that in many cases the cultivation of this grass is profitably carried out right throughout the New England district.

All are unanimous in the verdict of its suitability as a lawn grass. It only produces one flowering stalk a year, and where water is available there need be no fear of it being killed. Heavy seeding produces a fine flag, and if mixed with white clover, a better stand is secured, as the clover increases the nitrogen content of the soil.

Cocksfoot or Orchard Grass.

This is more permanent than any of the other English grasses. This may be attributed (a) to its fibrous and deep rooting character (Fig. 10), enabling



Fig. 3.—A Cocksfoot Pasture, 6 years old, continually stocked, Glen Innes Experiment Farm.

it to stand the dry weather, and (b) to its self-seeding habits. Of the seven-years pastures at Glen Innes, Cocksfoot has easily the thickest stand (Fig. 3). This grass, however, has one distinct disadvantage. Its tendency to mature quickly and become tussocky is very marked, and, on reaching this stage, it is not liked by stock. The new growth of the grass is much appreciated; and, to bring about a continuous new growth, it is wise to stock heavily—the grass will stand a great deal of stocking. The tussocky nature of the grass may be diminished by sowing thickly (Mr. Gennys recommends 40 to 50 lb

per acre), or by seeding with other grasses. It is ready for stocking six months after seeding, and the aftermath may be reckoned as growing twice as quickly as that of Kentucky Blue.

Cocksfoot is a grass that has still many adherents in New England district, because—

(*a*) it is readily seeded and catches with certainty;
(*b*) it establishes a thick stand;
(*c*) it can be heavily stocked;
(*d*) it is only very slightly attacked by frost and is fairly drought-resistant;
(*e*) it has high nutritive ratio—(a Glen Innes sample works out at 1 : 6·1).

A moist clay loam appears to suit it best. The tussocky and sod-bound nature of the grass in old pastures could be considerably diminished, and the pasture improved, by harrowing in spring and afterwards using the roller.

Timothy, or Cat's Tail.

This is the celebrated hay grass of America. Spillman says of this grass —"This is the principal hay grass of America, because (1), it has good seed

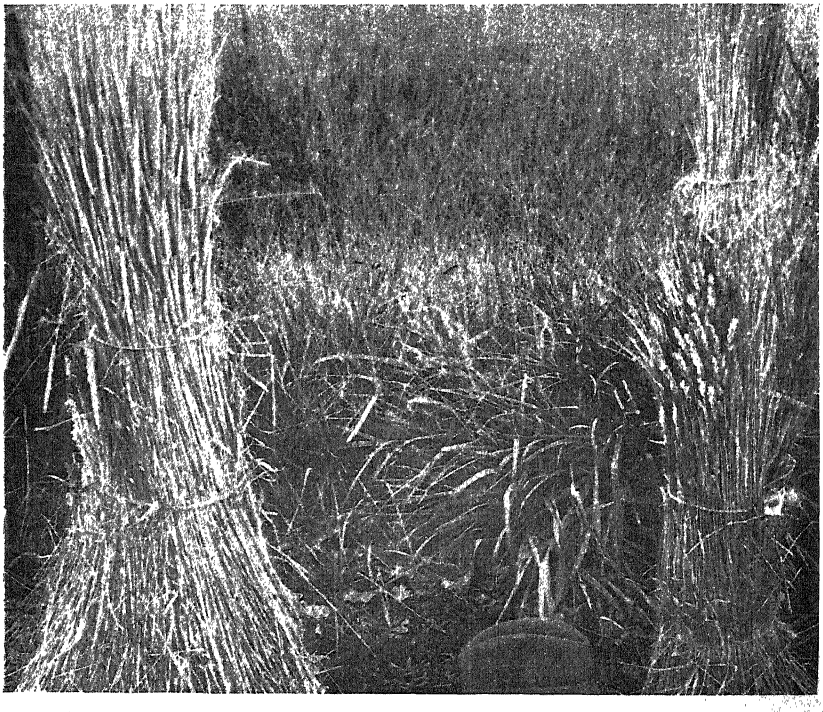


Fig. 4.—Sheaves of grasses grown by Mr. Giles Moore, Guyra. The principal grass in the sheaves is Timothy. Between the sheaves are growing *Phalaris bulbosa* in the foreground and Texas Blue in the background.

habits, (2) it is easily harvested and retains its vitality remarkably well, (3) the hay is easily cured, it bears handling well, and the grass may be cut any time between the blossoming and the ripening of the seed, (4) it is exceedingly palatable to horses."

Timothy is not grown extensively for hay in New Engand, although, as is evident from the size of the grass, shown in the sheaves in Fig. 4, it grows luxuriantly enough for this purpose.

Its success as a pasture grass has not been remarkable. It grows in the form of loose tufts, with few short leaves, so that red clover is usually sown with it to furnish a heavy bottom growth of leaves. The amount of starch and other fat-formers in Timothy is very large, and, when mixed with the red clover the two together make a complete food, the excess of fat-formers in Timothy off-setting that of muscle-makers in the clover.

The surface root system (Fig. 12) is against Timothy as a pasture grass. It is extremely hard hit by the dry weather, and very few Timothy roots can be seen after a few years.

On moist clay loam soils it would pay to cultivate as a hay grass.

Texas Blue Grass.

Very little has been done so far in laying down Texas Blue pastures, but the results, where it has been tried, are most striking. The grass is an extremely difficult one to seed, and the only safe way to propagate it is by root-planting. A sod can be separated into very small pieces, and if these are planted a foot apart each way, the spaces will soon be covered. A remarkable example of its rapidity of growth from root-planting may be seen at "Saumarez," Armidale. Mr. White states that an acre of ground has been covered in two years from roots originally obtained from three clumps. The photograph (Fig. 8) shows that the Texas Blue has a stand equal to, if not better than, *Phalaris commutata* (an inferior variety of *Phalaris bulbosa*), which has been in much longer. The grass is also doing well at the home of Mr. Giles Moore, Guyra (Fig. 4), and in the Grass Garden at Glen Innes Experiment Farm. It appears to remain dormant in the summer, and this helps it to endure the dry weather conditions better. Its roots penetrate deeper than those of Kentucky Blue Grass. It will stand heavy stocking, and its aftermath is very good.

Bromus inermis.

This grass is not receiving the attention it certainly deserves. The grass has done so well in the Grass Garden at Glen Innes (Fig. 9) that it was decided to establish a pasture of it. The grass has done well, and is obtaining a good stand. No stocking, however, has yet been carried out, so any report on its advisability as a pasture grass is premature. The grass comes with a highly flattering reputation from America, where growers have gone in for it extensively; and good results are anticipated from it in different districts of New South Wales.

Phalaris bulbosa.

Of all the grasses introduced into New England, none has made such a favourable impression as *Phalaris bulbosa*. The writer went to some considerable trouble endeavouring to obtain an unfavourable opinion of this grass, but failed to do so. All were unanimous in its praises.

There have been three strains of *Phalaris* tried at different times at Glen Innes Experiment Farm. One was *Phalaris cœrulescens* (an annual), another was *Phalaris commutata* (an inferior variety of *Phalaris bulbosa*), and the third *Phalaris bulbosa*. The last-named has proved to be the best.



Fig. 5.—*Phalaris bulbosa* (winter growth) at Wagga Experiment Farm.

The experience with this grass at Glen Innes Farm is as follows:—The pasture was prepared by partly planting roots in drills 1 foot 4 inches apart, and partly by drill seeding. During the first year it made good growth in winter, and was not touched by frost. It makes its best growth in spring (Fig. 6), and stood the dry summer well. The pasture has been stocked this year, and has stood it well (Fig. 7). The flag has become finer, the aftermath comes quickly, and it is a great favourite with stock of all kinds. The nutritive albuminoid ratio of a sample was extremely high (1 : 3·7).

Other Experiences.

Mr. Simpson, of Stonehenge, has gone in considerably for this grass, both for hay and as a pasture grass. The results in both cases have been highly satisfactory. Mr. Gunsell, Guyra, states that he has been stocking it for several years, and is more than satisfied with the results. Mr. Dalrymple,



Fig. 6.—*Phalaris bulbosa* (late spring growth), Glen Innes Experiment Farm.

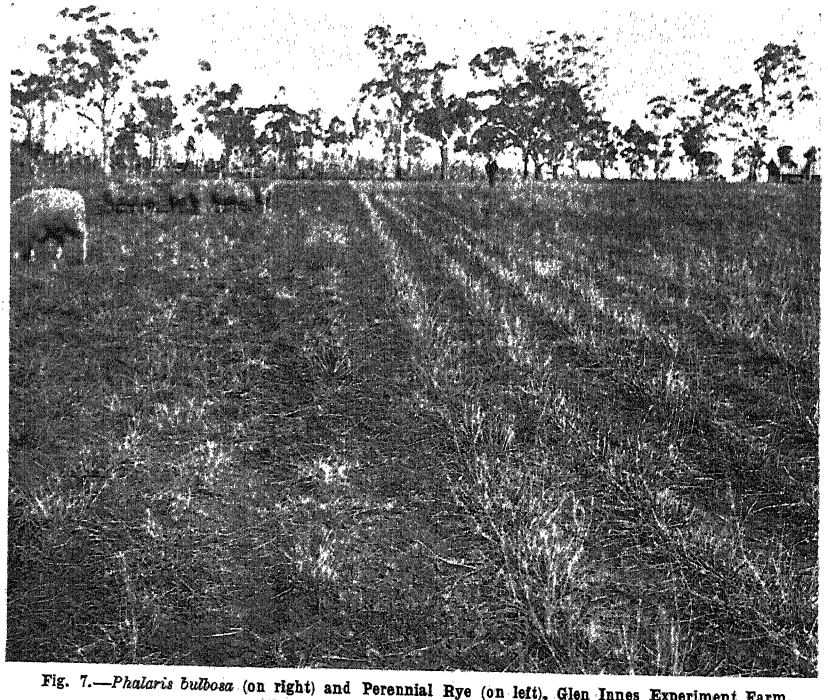


Fig. 7.—*Phalaris bulbosa* (on right) and Perennial Rye (on left), Glen Innes Experiment Farm. The former has been stocked two years.

Greenbank, Guyra, states that under stocking the clumps have become bigger and the stand thicker than when first established.

Mr. T. Head, Loch Leigh, Armidale, writes :—"I sowed about 3 acres of *Phalaris bulbosa* in March, 1912, at the rate of 2½ lb. per acre, on fair land. It did not get sufficient rain to germinate until June, after which it did not make much headway till early spring, when, after a good fall of rain, it came on luxuriantly, and made a very thick crop about 2 feet high, which I cut for hay. It made an excellent hay, which all classes of stock ate greedily. After cutting it was stocked heavily, and did not make much more growth, but grew enough to seed the land abundantly for this year, and it is now 3 or 4 inches high. It is not making much headway just now, but I expect it to come on again in the spring. As you will see, I have not had much experience with it yet, but so far I am very favourably impressed, and will probably plant extensively next year."



Fig. 8.—*Phalaris commutata* (on right) Texas Blue (on left) compared. Mr. F. White, Saumarez, Armidale. The Texas Blue is spreading with remarkable rapidity.

The principal points of interest about this grass are :—It appears to be well adapted to the different classes of soil in the New England district. It is palatable, fattening, makes good hay, stands stocking well, and is an excellent frost-resister. The root system, which is deep, thick, and covered

with woolly hairs (Fig. 11), enables it to stand dry weather conditions. Its nutritive qualities are high, and it is established from seed just as quickly as from roots.

Native Grasses.

A native grass of considerable merit and promise in New England is Wallaby grass (*Danthonia semiannularis*). It is very common, and may be seen on land where heavy stocking has killed out the Kangaroo grass. Although small, it provides an excellent turf, and if given a chance, will quickly cover the ground. This grass appears to stand the cold weather as well as any of the introduced grasses. It is a good pasture grass, and is a favourite with stock. Unfortunately, good seed is a scarcity just now, but it is hoped that New Zealand, where the cultivation of this grass is extensively carried out, will be able to supply reliable seed.

Schedonorus Hookerianus.

Hooker's Fescue or Pole Grass possesses considerable virtues as a cattle grass. It stands cold weather extremely well. The grass appears to only have been extensively grown on the estate of Mr. White, Armidale. Here it has spread rapidly, and is stocked heavily. A pasture of Hooker's Fescue somewhat resembles that of Paspalum, the two grasses being alike in habit.



Fig. 9.—A clump of *Bromus inermis*. Glen Innes Experiment Farm.

Advantages of Cultivated Grasses.

Most pastoralists throughout New England agree that the grasses mentioned above, where they can be grown to a more or less successful issue, will carry twice as many stock as the native pastures. In some cases (*e.g.*, Armidale) the cultivation has been abandoned on account of the dry seasons. But it is seldom that many successive dry periods occur in New England, and, even if one dry season occurred every few years, the increased revenue obtained from the pastures in that period would more than repay the expense of cultivating and seeding. It also appears that sheep fed on artificial pastures not only fatten much better and more quickly, but are also more immune from certain diseases than if fed on the wild native grasses. At least, such was proved to be the case in experiments carried out with "lung-worm" infected sheep at Glen Innes (*vide Agricultural Gazette*, Vol. XIX, page 984, and Vol. XXIV, page 116). In these experiments it was found that with sheep fed on a liberal diet of artificial grasses the number of worms not only diminished but that there was an increase in weight of 9 lb. in twenty days.

OTHER FODDER PLANTS.

Lucerne.

Lucerne growing has not been carried out with great success in New England. On the heavy black clays, the subsoil is too cold, too retentive of moisture, and it cracks badly in dry times. There is evidence, which is supported by the Manager of the Experiment Farm, that it is likely to do better on the gentle slopes of red or dark soil with a lighter subsoil. Stones or decomposed basalt appear to be the best; in any case there must be good drainage.

The lucernes tried at the Farm that appear best adapted to New England are Algerian and Montana. Following are some particulars, as indicated by the records taken at the Farm :—

Algerian Lucerne.—Good stooler and hardy; only slightly touched by frost in winter; good growth in summer; slightly affected by rust. Cut 19 tons of green stuff per acre a year; has been growing three years eight months.

Montana Lucerne.—Matures fairly quickly; stands frost and dry weather well; liable to rust; provides three or four cuts a year. Produced 13 tons 8 cwt. of green stuff per acre in one year.

Clovers.

The clover best adapted to the New England district appears to be Perennial Red clover. It is a common practice to sow red clover with artificial grasses, with very beneficial results. It provides a desirable combination with the grasses, besides adding to the nitrogen content of the soil.

Throughout New England red clover can be cultivated as a hay crop, and also to a limited extent as a pasture. It is doubtful if clover hay can be excelled by the hay of any other fodder-plant. The clover pasture at Glen Innes Experiment Farm has lasted for six years. In the second year the clover was allowed to seed. It was then roughly harrowed in order to shake

the seed out. Clay loam soils that lie upon a subsoil of mild clay are considered the best. Stock should not be turned in till the clover has made considerable growth. Care is required in pasturing, as stock are extremely fond of it, and there is danger that there will be a tendency to bloat.

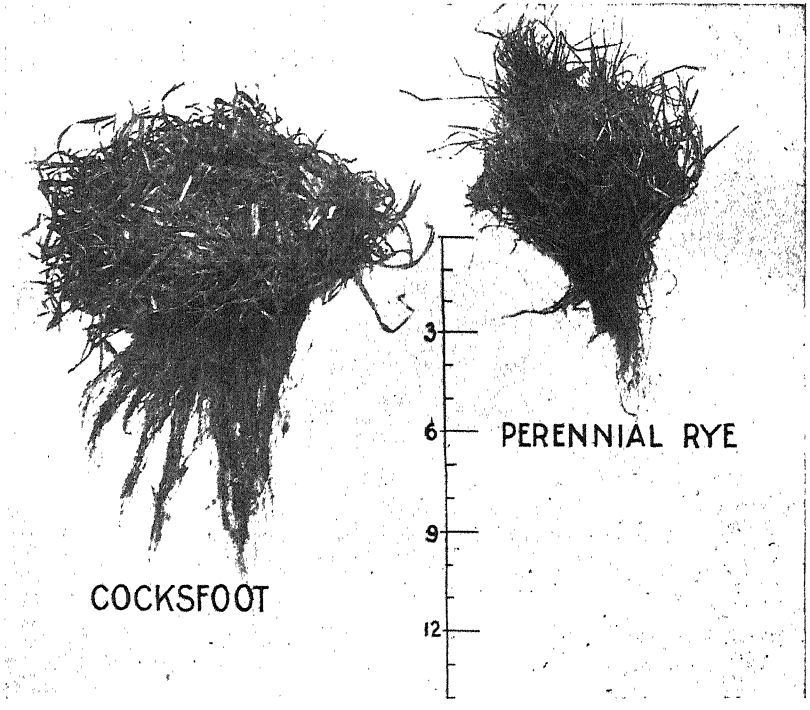


Fig. 10.—Root Systems of Cocksfoot and Perennial Rye. Note the deep fibrous root system of Cocksfoot.

Sheep's Burnet.

Sheep's Burnet (*Poterium sanguisorbe*) thrives remarkably well in New England, in both winter and summer. It has proved to be a good drought resister. The Armidale district appears to be particularly well adapted to it, and, at the home of Mr. White, Armidale, has become more or less a pest, taking possession of pastures that were once laid down to artificial grasses. When mature the plant is very fibrous, and is not liked or even touched by stock. In its young stages, however, there is evidence that it is eaten, but not in preference to the introduced grasses or other fodder plants.

Summary.

The cultivation of artificial grasses in New England is a profitable undertaking, in spite of the periodical dry seasons experienced. Perennial Rye, Kentucky Blue, and Timothy should be cultivated on low-lying situations, as they suffer severely in dry weather.

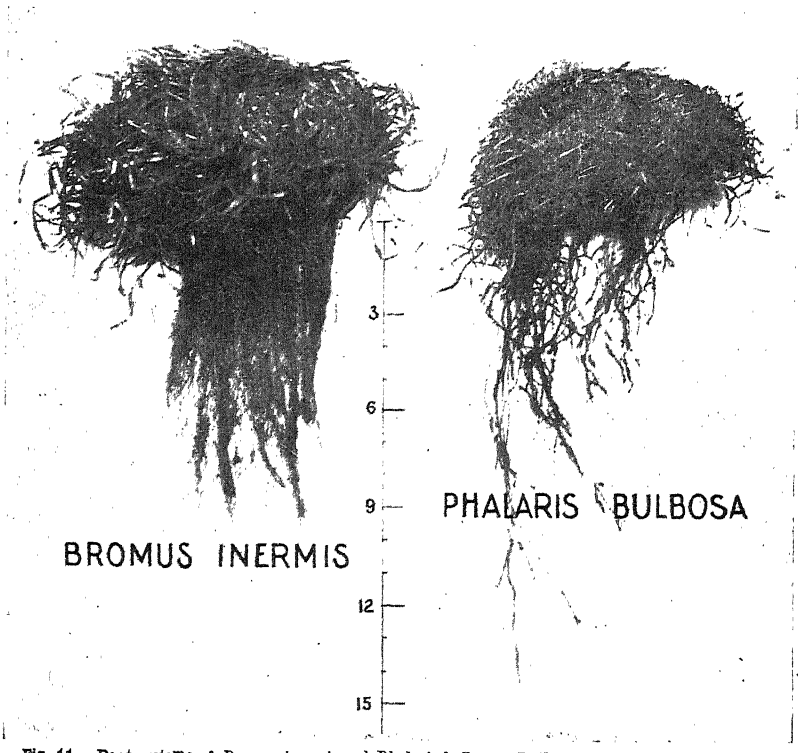
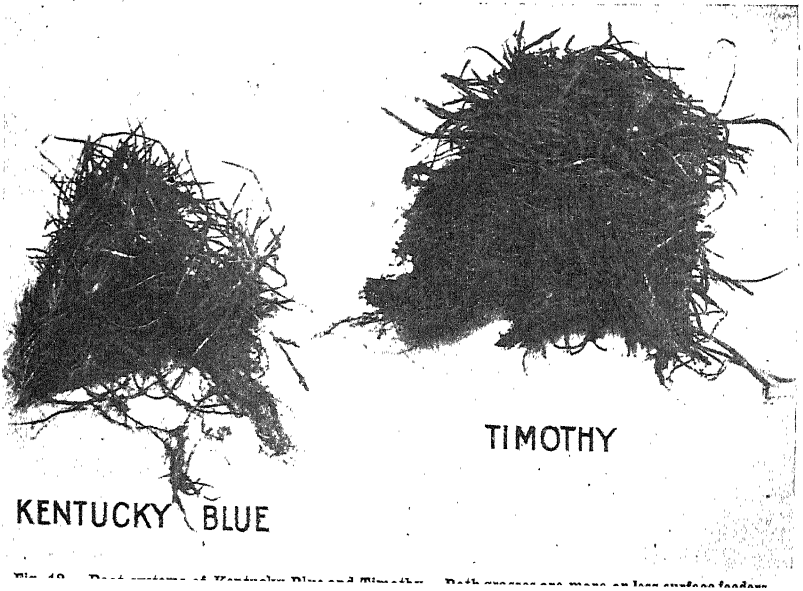


Fig. 11.—Root systems of *Bromus inermis* and *Phalaris bulbosa*. Both possess good "dry weather" root systems.



Of the introduced grasses, Cocksfoot, *Bromus inermis*, Texas Blue, and *Phalaris bulbosa* appear best adapted to the drier situations.

Phalaris bulbosa so far appears to be the best of all the introduced grasses hitherto tried.

Of the native grasses, *Danthonia semiannularis* (Wallaby) and *Schedonorus Hookerianus* (Hooker's Fescue) show considerable promise in standing both winter and summer conditions, and in being acceptable to stock.

Lucerne-growing on a profitable scale appears to be confined to situations with a well-drained subsoil, and particularly to basaltic slopes.

Perennial Red Clover can be successfully grown (1) as a hay, (2) as a soiling crop, and (3) to a limited extent as pasture. It grows best on rich soils, such as heavy black clays.

There is no evidence to justify the cultivation of Sheep's Burnet as a paying crop; on the contrary, its introduction in pastures should be treated with caution.

Conditions Governing the Importation of Potatoes for Food Purposes.

Commonwealth of Australia,
Quarantine Bureau,
Department of Trade and Customs,
Melbourne, 28th March, 1913.

The conditions under which potatoes grown in New Zealand may be imported until 31st December, 1913, are as follow:—

(a) That the potatoes are accompanied by an official certificate identifying the shipment and certifying that they were grown in New Zealand, and that they have been inspected and show no signs of the following diseases:—

Phytopthora infestans	Potato blight.
Synchytrium endobioticum ...	Potato canker, black scab, warty disease, and cauliflower disease in potatoes.
Lita solanella	Potato moth.
Oöspora scabies	Potato scab.
Anguillulidæ	Gall or eel worms.

(b) That they are packed in clean new bags.

(c) That the bags, crates, or other packages are marked with the name of the country of origin.

(d) That upon inspection at the port of discharge in Australia the potatoes are found free from disease, and are so certified by a Plant Quarantine Officer.

(e) That no importation shall take place without the permission of the Minister given prior to the shipment of the potatoes from New Zealand.

Produce merchants desiring to import should make application for the Minister's authority to the Chief Quarantine Officer for Plants, Department of Agriculture, Sydney.

Handy Gear for Building Ensilage Stacks.

GEORGE MARKS, Inspector of Agriculture.

As a result of several practical demonstrations given in ensilage making on the coast, many requests have been received, in which information is sought regarding the methods adopted in lifting heavy bundles of maize on to the stack when at some height from the ground. As there are undoubtedly many farmers living in distant localities who are not able to visit farms where such work is in progress, the following description of the gear used will probably be of interest. In newly-settled districts where holdings are not yet properly cleared, or paddocks cleared up, much labour and capital have to be expended, and silos are usually beyond the means of the struggling selector. But the owner need not be deprived of ensilage. He can make it in the stack. There will of course be a greater proportion of waste, but an extra quantity of material can be grown to make up for this, while the wire rope, wire, blocks, &c., required will not cost more than a few pounds at most. The stack system also enables the farmer to place his material in any locality on the farm, so that should the crops be grown in different parts each year they may be built near by if economy is desired in haulage. Then again, the wire ropes and blocks bought need not be kept solely for ensilage purposes. They will prove invaluable to the pioneer in assisting in the pulling of logs together in the clearing of timbered areas, and provided they are reasonably cared for, will last a considerable time. On the other hand it almost invariably happens that such apparatus is in use on the partially improved holding, in which case no additional cost is involved, but merely an adaptation of the material at hand for stack requirements. Spars of practically any size and length can be obtained by going to the bush paddock or neighbouring mountain spurs, so that these only cost the time and labour of procuring them.

Before proceeding with the assembling of parts the following will be required :—

A pole 35 feet to 45 feet long, and about 4 inches diameter at the small end.

An arm 12 feet to 14 feet long having a natural fork at the heavier end, about 3½ inches or 4 inches diameter at small end.

Two double-sheaved iron blocks, 6 inch sheaves.

Three single-sheaved iron blocks, 6 inch sheaves.

130 feet of flexible steel-wire rope, 1¼ inch circumference.

60 " " " " " 1¼ " "

65 " " " " " 1¼ " "

A B Mast
C D Arm
E F G H Wire stays 100 feet long
0 0 Hemp rope sling
1 2 Double sheaved blocks
3 4 5 Single sheaved blocks
6 Lifting rope

Mast

Fig 2

Diagram of stack foundation showing position of mast on one side

Fig 3

Mast Section

Arm showing natural fork and how it swings round the mast

Fig 5

Mast Section — Arm — Bolts

Fig 4

Body of dray showing rope sling spread on bottom so that load will not cant when being lifted

Double block
Double block
E
F
A
D
H
1
2
12 to 14 Ft
C
3
G
40 Ft
4
Light rope to pull load round
0 0
Single blocks
Iron pin
Swingle bar
Horse
6
5
4 Ft
B
Stack End view

Fig 1

Four lengths of No. 8 galvanized fencing wire, 100 feet to 120 feet long.
Hemp rope for slings.
A ladder.
Several yards of extra fencing wire, or tested chains with which to fasten blocks in position.
Four light poles, 20 feet long.

The pole which is to constitute the mast should be cut some time beforehand, barked and left so that it can dry. By so doing the weight will be considerably reduced, which will facilitate its erection into position later on. It should be as light as possible without sacrificing rigidity and strength.

The arm can be much lighter. The fork should be fairly wide at the base, but it may be necessary to cut portion of the inside away so that it will, when lifted into its place, move freely around the mast.

If it is not practicable to secure just the desired shape, two stout pieces of wood, say 3″ x 2″, can be bolted on either side of a straight arm and the necessary curve made to fit on the mast (see Fig. 5).

The mast should be firmly set in a hole 4 feet deep. A sloping side should be cut which will facilitate operations, and a wide plank or slab placed on end on the opposite side so that the bottom of the mast will slip in easily and not cut into the bank. A groove should be cut round the pole a few inches from the top, and the four wires that are to act as stays securely fastened. The double block is then attached a few inches lower down either by a piece of tested chain, or by winding a piece of fencing wire round five or six times and then twitching it fairly tight so as also to leave a loop to hook the block into. The block 1, Fig 1, is then sheaved with the 60-foot and 65-foot lengths of wire rope, and the ends drawn through and fastened by cord to the mast lower down, so that they will not run through while erecting the mast. The mast is then lifted to its vertical position by either shear-legs, or, preferably by attaching a block to a tree close at hand, and by means of the long rope, or a extra piece fastened to it, and using two pairs of bullocks or a pair of horses to pull it up. In the meantime the mast is prevented from swaying to either side by two men holding on to two opposite stay wires and taking a turn round a fence post, stake, or other support previously set in position. With everything properly arranged, a steady pull is sufficient to lift the mast, which is then kept in its proper place by carefully fastening the four stay wires at the proper angles to any secure support, such as stumps, trees, fence posts, or, if these are not available, to stout stakes driven to a good depth till they are perfectly rigid. The wires should be drawn tight, and as they give during building operations, any slack should be immediately taken up so as not to allow of any play in the mast. The earth is then well and firmly rammed round the base. The mast should be perfectly upright or inclining a little to the stack. This will enable the loads to swing round to the centre of the stack with greater ease. The arm can now be lifted on to the top of the stack and the ends of the two separate wires that were passed through block 1, tied to each end, the longer wire being

secured at the juncture of the fork. Grooves previously cut round at each place will prevent slipping. The wire rope is very flexible and can be tied as easily as ordinary rope, but it will be necessary to secure the end in each instance to the main rope by a piece of cord so that the hitches will not spring loose. Double block No. 2 and single block No. 3, Fig. 1, are then secured to the arm on the side opposite to the wire ropes in a similar manner to block No. 1, at the top of the mast by wire or chain. These are now ready to be sheaved with single block No. 4. But, before this is done, it is preferable to have the pulling rope drawn by a horse round the paddock and in between or around stumps or trees. A better plan is to have some heavy work done, such as pulling logs together. This will take out the wind that it gets in the coil, and will prevent twisting when in later use, and save unnecessary wear and work. One end of the wire rope is run through block No. 5, which is secured at the bottom of the mast, then through block No 3 at the lower end of arm, then through one sheave of block No. 2, through block No. 4, thence through second sheave of block No. 2, and finally fastened to the ring of block No. 4. A ploughline is then tied to the bottom of block 4 with which the loads are pulled round by, and also to prevent the block being pulled too high and out of reach by accident. The arm is then pulled up by the two single wires and kept in position by tying the ends around the bottom of the mast. An iron pin or bolt inserted in the mast will prevent either slipping up when subjected to the strain of the loads. At the other end of the pulling rope a swingle bar is fastened. With this, a sturdy, quiet horse is used to lift the load. With this arrangement there is no difficulty in lifting at one pull a dray-body load of green maize, which would represent, according to length, 7 or 10 cwt. First it is necessary to draw attention to two matters: the size and strength of wire rope used; and, secondly, the size of the blocks.

Rope.—The breaking strain of 1¼-inch flexible steel-wire rope, best quality, is 4 tons. In ensilage work there would probably not be a strain greater than 10 cwt. or 12 cwt. at any one time, and it might be thought that a saving could be effected in procuring a much lighter rope. A lighter rope would certainly do, but it is found in practice that such would not wear proportionately as long on account of the greater friction on the smaller surface in running through the blocks. It is, therefore, not advisable to purchase a smaller diameter rope than that given.

Blocks.—It might similarly appear that 6-inch sheaved iron blocks are much too large and heavy for the work required. Smaller blocks could be used, but these would have the effect of increasing the wear of the rope considerably, through it being bent at a sharper angle in running through the smaller sheaves. It is, therefore, more economical to use the 6-inch sheaves. It is scarcely necessary to mention that the pins of all blocks should be well greased before being used.

The slings should be made of 2 inch circumference hemp rope, spliced, and long enough to go double round a good body load. They are placed on the bottom of the dray prior to loading, as shown in Fig. 4, and spaced

some distance apart, so that the bundle will not tip up on end in lifting. At the stack, one end of the loop is passed through the other, then hooked on to Block 4, Fig. 1, and the whole lifted bodily up. The weight of the load can be increased or decreased to fit in with the horse-power for lifting that is at hand. Care must be taken to see that the loads are dumped in the middle of the stack or evenly over the surface, so as to secure uniform pressure, otherwise the stack will get a lean on. The arm can be set at any angle or height desired by tightening or slackening either or both of the ropes suspending it, and with the light line there is no difficulty, when the load is suspended, in pulling or swinging the bundle round to any desired position.

The light poles are not absolutely necessary, but their use at each corner of the stack foundation will be of great assistance in enabling the builder to locate his corners, and help in keeping them square and the sides upright. As shown in Fig. 2 the mast should be located at the centre of the long side of the stack. The wire stays through their length enable the arm to be swung round underneath them if required. Shorter ones would necessitate the arm being lowered somewhat to achieve this result.

COST.

Best quality steel-wire rope, $1\frac{1}{4}$ inch circumference, breaking strain 4 tons.

	£	s.	d.
130 feet, approximate weight 33 lb., at 1s. ...	1	13	0
60 „ „ „ 15 lb., at 1s. ...	0	15	0
65 „ „ „ 16 lb., at 1s. ...	0	16	0
3 single 6-inch sheaved iron blocks at 6s. ...	0	18	0
2 double „ „ „ „ 9s. ...	0	18	0
	£5	0	0

The fencing wire can be taken from the spare coils held in reserve for fence repairs or extensions, while the hemp rope will only run into a few shillings.

GUAR (*Cyamopsis tetragonoloba*).

REPORTS on trials of this legume, which in America had proved itself to possess remarkable drought-resisting properties, were published in the *Gazette* for November, 1911, page 1000, and September, 1912, page 769. Further trials have been made at the Grafton Experiment Farm, and the Experimentalist has furnished the following report:—

A small trial of this legume was made on 20th September, 1912, four rows being sown 2 feet 6 inches apart, and 3 chains long. The seed was obtained from the previous autumn crop.

The trial is stated to have been an entire failure. The germination was very poor, and the plants very dwarfed, owing to hot, dry weather conditions.

As very little definite information is available in reference to this legume, and the results of two seasons seem to indicate the unsuitableness here for cultivation in the summer months, it is proposed to make a small sowing immediately, as a small quantity of seed ($1\frac{1}{2}$ lb.) is on hand. A little seed will be retained for further trial in the spring in case the above crop proves a failure.

The Whip-stick on the Farm.

R. N. MAKIN, Assistant Inspector of Agriculture.

A SIMPLE and effective device for lifting fodder crops in stack-building, and also in lifting water from streams and dams, is found in the whip-stick. It has been in use in parts of the South Coast in silage stack-building, and has proved very effective. At Moss Vale several farmers adopted it, and at Dapto, Robertson, Albion Park, and Moruya stacks of silage have been built under my supervision, using this device for lifting the stuff, and it has always worked satisfactorily when properly rigged, and there is nothing simpler.

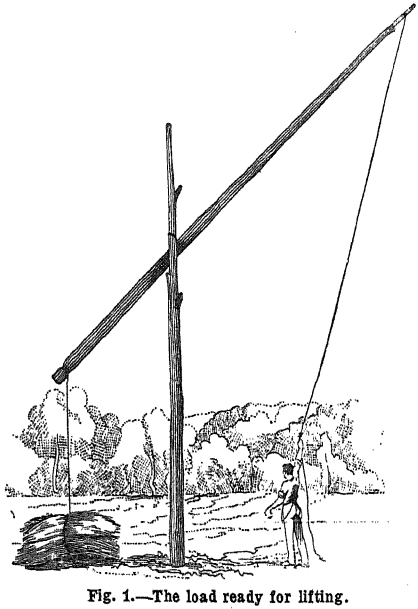


Fig. 1.—The load ready for lifting.

The illustrations show the stick as erected on Mr. George Lindsay's farm at Dapto. In this case two poles were secured about 35 feet long; the stouter was sunk in the ground about 3 feet 6 inches, and the other used as a cross-piece, or "whip." In erecting the whip it is first of all necessary to find the balance—for successful working, it is better to have it slightly off the balance in favour of the thick end, —the load end. In raising the whip into position, the best plan is to make use of a block and tackle. When at the requisite height a bullock chain taken once round the whip and looped and then securely attached to the post, leaving about 1 foot of the chain between the whip and post slack. This slack chain is a means whereby the load may be deposited anywhere on the stack by pulling the whip round the post.

Before adjusting the whip it is necessary to attach a trace-chain and length of rope to the thin end in order to pull this end down when the load is attached—the thick end of the whip being always down when not in use. On the thick end—the load end—another trace-chain will be found very serviceable for attaching the load.

The main point is to get the right balance of the whip-stick, and this will be found by experience, as sticks vary in weight and length. The stick illustrated is 35 feet long—a convenient length. The stick, to be successful,

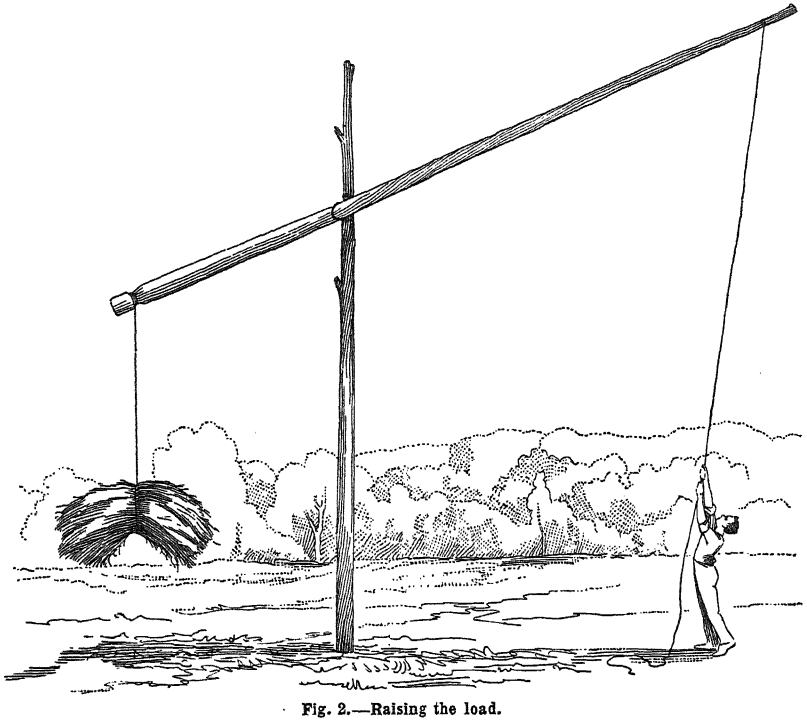


Fig. 2.—Raising the load.

must be straight and about 6 inches through at the base. A well-seasoned gum stick suits well, and a green wattle stick has also proved very satisfactory. When stacking stuff under an open shed, the whip may be attached to one of the posts of the building with satisfactory results. It is a good plan to rig the whip low when starting the stack, and, as the stack increases, raise it. As to the weight, I have seen a 12-stone man hoisted on to a stack, three stout fencing-posts hoisted up, and a school-boy hoist 1 cwt. of greenstuff.

The method of bringing the green-stuff in on a slide and using the whip-stick to elevate it, works well. When the slide goes to load up, three ropes are taken. Before loading, one rope is laid across the bottom of the slide and the cut crop placed upon it. When the slide is about one-third laden, the second rope is placed across; then when

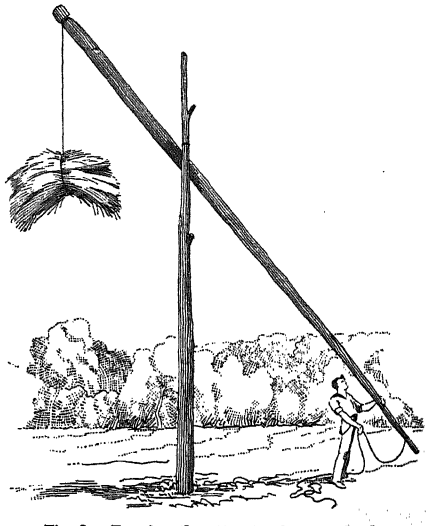


Fig. 3.—Turning the stick to place the load where desired.

two-thirds full, the third rope is placed across and the slide topped up. When the load is drawn up under the whip-stick, No. 3 rope is tied over the bundle under which it rests, and is hauled up and so on with Nos. 2 and 1. By this means, the slide is quickly unloaded in three lifts.

For simplicity and convenience in hoisting, the whip-stick has much to commend it.

Aphis-Infested Rape and its Effects on Sheep.

In September, 1911, the death of certain sheep at Cowra Experiment Farm, which had been fed upon aphis-infested rape, was investigated by the Bureau of Microbiology, with a view to ascertaining the possible connection between the feed used and the deaths. The suggestion was then made that sheep should be deliberately fed on the aphis-infested rape. Owing to the fact that the rape was not affected by aphis in 1912, it was not possible to carry out the experiment till the present year, when three Merino ewes were yarded at the Cowra Experiment Farm and were liberally fed daily with rape covered with aphis. In addition, they had a small amount of green wheat supplied, so that they would not be confined absolutely to rape. They were also given rock salt. For one day they did not eat the rape, but for the six following days they ate it regularly and showed no ill effects. As the experiment seemed sufficiently conclusive, it was not continued longer.

Three small beetles were recently submitted for identification to the Entomological Branch from Casino, together with a branch of a tree on which they were found. It was noted as a somewhat peculiar circumstance that, although the tree on which they were found was surrounded by various other ornamental and fruit-trees, rose-bushes, &c., the beetles were found on it only.

In his reply the Entomologist stated that the specimens sent were not beetles, but plant-sucking shield-bugs (*Tectocaris lineola*), which resemble beetles in appearance, but are without jaws. The mouth is in the form of a long sucking beak, and they feed on plant-juice. This is the third lot of these bugs sent from the Northern Rivers and stated to be attacking cotton-bush only. It seems that it has not yet attacked garden shrubs or orchard trees. It is a native of the scrubs from Richmond River and Queensland, and varieties have been found in New Caledonia, Java, and Sumatra, and there is one record of it in the Blue Mountains. Fortunately it is not yet a pest, as are the large green and spined bug (*Biprorulus bibax*) and the bronzy orange-tree bug (*Stilida indecora*), two native pests on orange-trees in North and North-western New South Wales.

Horse Breeding.

H. W. POTTS, Principal, Hawkesbury Agricultural College.

THE possible advance of horse breeding in Australia appears to-day more promising to stud-masters and farmers than at any period of agricultural progress in our history. The prevalence of prosperous seasons, and the rapid alienation and occupation of lands under closer settlement conditions, provide factors inducing keener attention to the horse-breeding industry. Experienced breeders, responsive to the encouraging prices offered for well-bred draught stock, are exhibiting admirable enterprise in the purchase and importation of stock from the finest studs in Great Britain. Evidence of this is apparent in the size and quality of the stock exhibited of late years at the leading shows and horse parades. A distinct and welcome change is being introduced in type and conformation in Shire, Suffolk Punch, and Clydesdale, more especially in the case of the last-named.

To the breeder of a bygone day, the modern Clydesdale does not appeal. The thick-legged, coarse-feathered, sturdy animal, which was once most favoured, is giving place to a horse of finer conformation, better bone, and freer action. The old conception that weight provided the main feature in an animal's value, is being modified by the more attractive and profitable qualities of gameness and activity, combined with a long sweeping stride, well-flexed hocks, soundness of leg and foot, and light, sparse feather.

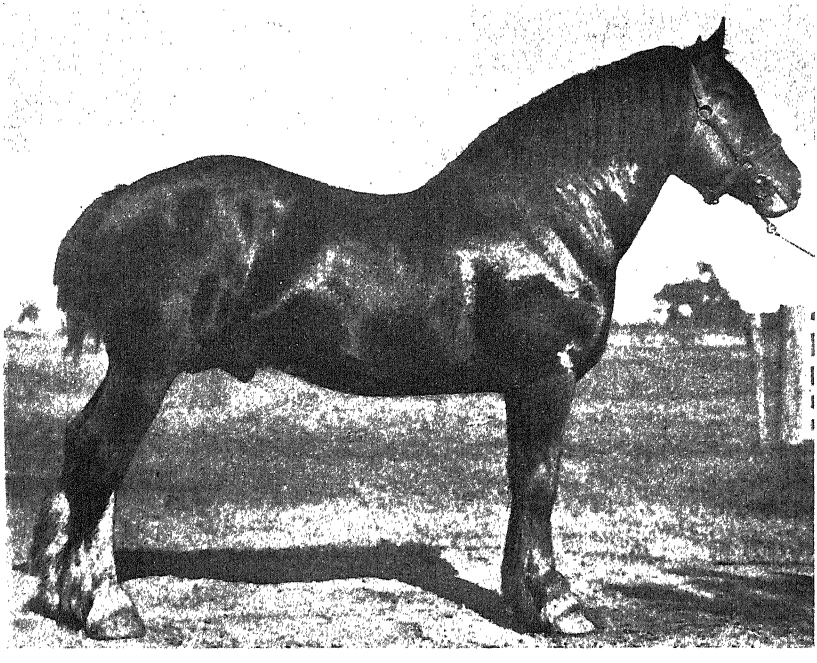
New South Wales possesses many notable advantages for the horse breeder in soil, climate, environment, and extensive areas. These ensure a degree of stoutness, vigour, and freedom from disease rarely manifested in the horse elsewhere. It is a recognised axiom that a warm, dry climate, associated with a good soil and natural pasturage spread over undulating country, beneficially influence the type and character of the horse raised there. That has been demonstrated in Arabia, where the finest horses in the world have been bred.

In New South Wales we have a tolerably even temperature in winter and summer alike, and these tend to the development of the finer qualities mentioned, more especially where there exists a minimum of dampness.

The steady extension of wheat-growing and cultivation throughout our semi-arid western areas, the general expansion of mixed farming and other attractive phases, as well as the rapid settlement on the areas controlled by the Murrumbidgee Irrigation Trust, are all stimulating the market for draught stock, and making it imperative that every farmer should systematically adopt horse-breeding as an essential part of his activities. The areas thus indicated include an unlimited range of undulating country, noted for the growth of dry, though palatable and nourishing, natural grasses. These in addition to constant sunlight afford exceptional advantages for the horse breeder.

Horses bred on hilly country grow muscular and hardy. They acquire a quick sense of judgment, develop smart and even action, keen sight, and grow sound legs with tough, well-formed hoofs.

Many breeders agree with the views of Mr. Bruce, the late esteemed Chief Inspector of Stock, when he stated that "the climate, natural features, soil, and pasturage in the country known as the Western Slopes of New South Wales—that is, the hilly, undulating country (not the mountainous) on the west side of the great dividing coast range, which extends from the southern to the northern boundary of the State—is such as to render it



Clydesdale Stallion Royal Warden (imp.).

Stationed at the Hawkesbury Agricultural College. A comparison between this picture and that illustrated in the December issue will clearly show how well he has responded to the new conditions.

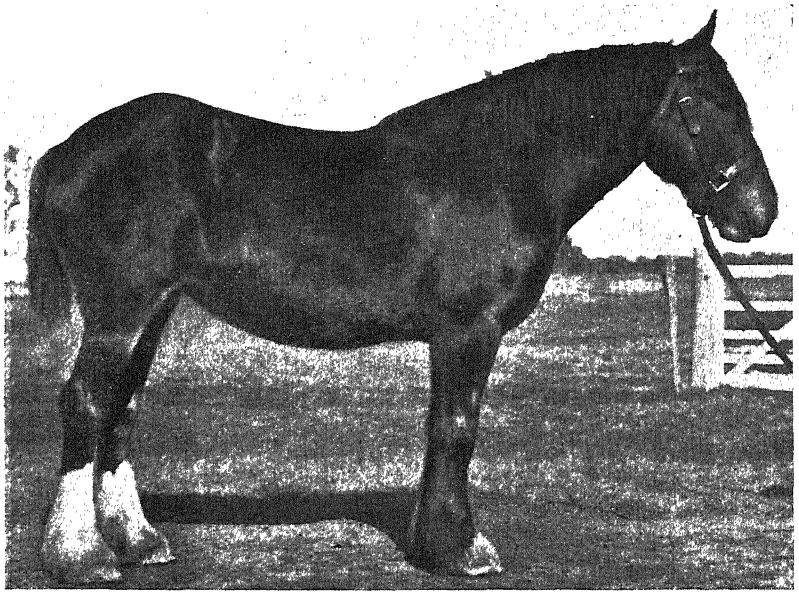
superior to almost any other part of the world for horse breeding, excepting, perhaps, in the neighbouring States of Victoria and Queensland." Experience has confirmed Mr. Bruce's prophetic estimate, which was written over fifty years ago. Doubtless he especially referred to the breeding of light horses at the time, but what he wrote holds good equally for draught stock.

The successful breeding and management of stock depends, in a large measure, on the judgment, training, foresight, and aptitude brought to bear on the varied phases of the industry by the farmer. The selection and mating

of parent stock to secure satisfactory results is no mean task. Darwin states :—

> Not one man in a thousand has accuracy of eye and judgment sufficient to become an eminent breeder. If gifted with these qualities and he studies his subject for years, and devotes his lifetime to it with indomitable perseverance, he will succeed, and may make great improvements. If he lacks any of these qualities, he will assuredly fail.

This expression of opinion by such a revered scientist was obviously intended for those who select special lines of work in breeding, in endeavours to produce new types—the class of breeders to whom we may credit our valuable breeds of sheep and pigs. The quotation is advanced only to emphasise the need for thought and observation on the part of the farmer when raising stock.



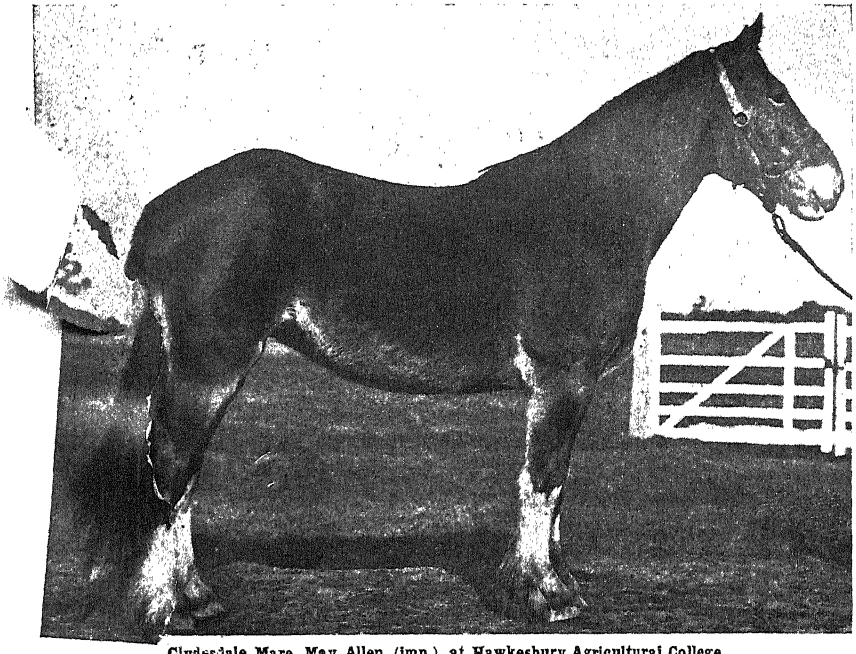
Clydesdale Mare, Green Foot Jewel (imp.), at Hawkesbury Agricultural College.

The average careful breeder can do much not only to maintain the distinguishing features of the type he wishes to reproduce, but by shrewd selection and the adoption of rational methods of management and feeding of the young stock, to steadily effect improvements and more nearly approach the ideal standard of type.

In all young countries such as Australia, the demand for horses responds to the prevailing natural conditions. Here we have unlimited areas of land, thinly populated, and eminently suitable for agriculture, irrigation, and stock raising. Land values being low, horses are more essential for the successful conduct of the primary industries.

Many farmers advance the argument that the breeding of draught horses has seen its best day, and that a reaction is within sight in favour of motor

machinery. So far, however, no reliable data can be shown to suggest that this can occur in a country where feed and water are plentiful, and no apprehension need be felt on this score. The prices offered for reliable draught stock must, for a long period to come, be sufficient inducement. For several years the demand has been exceptionally good, and the presence of the factors operating to create this healthy market still exist, and in a more intense degree than ever. Many breeders appear content to raise a useful stamp of draught horse, of good constitution and free action, which can be sold at three years old at a reasonable figure. Weight continues to attract attention, and this, combined with quality and conformation, are looked on with favour.



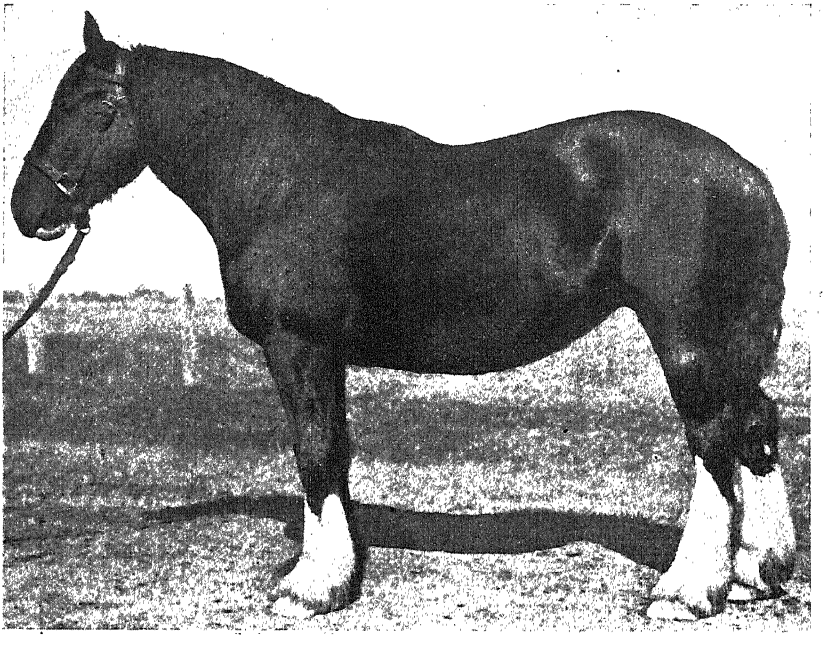
Clydesdale Mare, May Allen (imp.), at Hawkesbury Agricultural College.

A horse endowed with courage, activity and stoutness, and also showing depth of body, short coupling, heavy muscle, with good bone, sound feet and docile temperament, must always have a ready sale.

The Crossing of Types.

It is popular practice to cross types in order to increase some special quality that may be deficient in sire or mare, or both. This may be in response to the recognised principle that the first-cross progeny of any domestic breed is of exceptional merit, but there are serious objections for results do not always justify the practice. The Shire has frequently been crossed with the Clydesdale, with the avowed intention of producing stock of

greater height and weight, but the experience already gained here corresponds with that obtained by breeders in England and Scotland. The resultant cross has not given satisfaction, in so far that weight and height were secured at the expense of action. The smart movement and gameness of action so prominent in the Clydesdale, was replaced with the somewhat clumsy, deliberate and slower gait of the Shire. Other cases could be cited to illustrate this, but sufficient has been said to warn breeders of the possibility of error in this direction. It is fair to urge that there are more likely to be reliable results in breeding out faults by the intelligent mating of parents of the same breed than by crossing different breeds. Selection within the limitation of the one breed is much more likely to prove satisfactory.



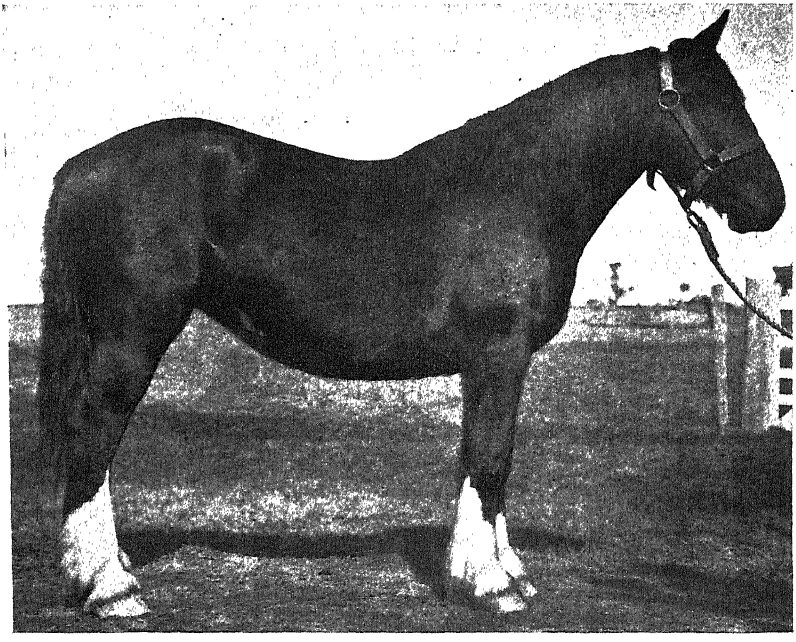
Beauty, 3 years old, by Plucky Willie, dam Florrie. Bred at Hawkesbury Agricultural College.

The Choice of a Sire.

There is no other point connected with the breeding of horses of more importance to success than the choice of a sire. A definite ideal must be in the breeder's mind in relation to type. Pedigree is an essential, and purity of lineage cannot be too strictly insisted upon. The next inquiry must be for the Stock Department certificate of soundness and conformation, freedom from hereditary disease being only ensured as the result of the examination by a qualified Veterinary Surgeon. The transmission of disease has been painfully apparent in the past, but breeders have no excuse now

for employing unsound sires The main object of the breeder is to secure strength, and at the same time the staying power that enables a horse to do a hard day's work for a lengthened period.

The sire must be active, intelligent, and tractable, though full of determination. Beyond all dispute the best evidence of a horse's staying power and length of service in the heavy breeds, is balanced action—the movement and stride that enables a horse to cover the most ground with a maximum of ease and a minimum of friction and wear. True action has a special value in both sire and mare, for where the feet are raised and placed in precise and regular form in walking and trotting, there is resistance to bone and joint troubles, and there is also lengthened service. An evenly balanced body would lose its value on ill-shaped feet, or abnormally dropped legs.



Thelma, 2 years old, by Plucky Willie, dam Florrie. Bred at Hawkesbury Agricultural College.

Constitution and stamina are also needed to withstand the stress of continuous work.

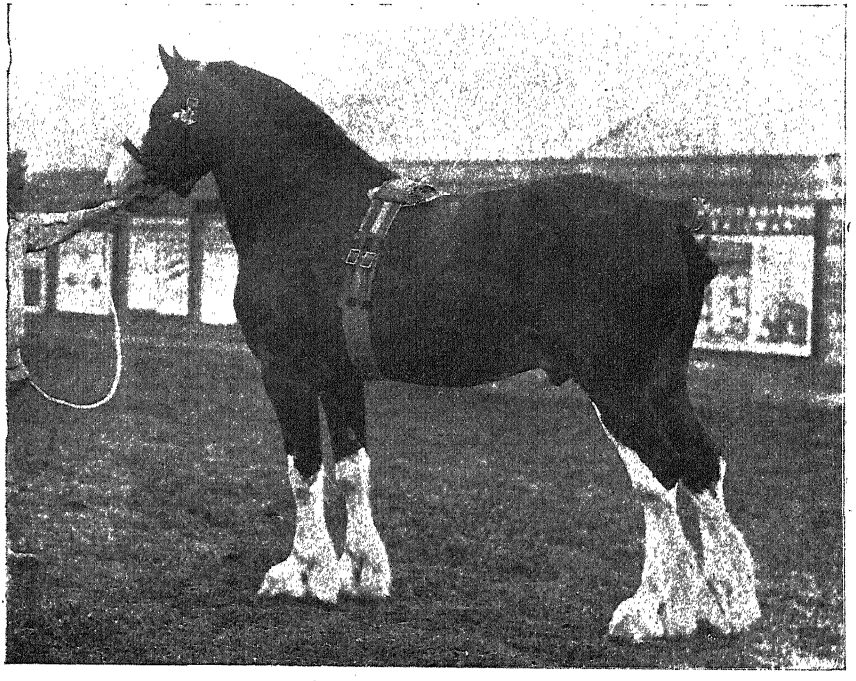
The indications of a general nature must include a good barrel or middle piece, showing ample space for digestion, and vigorous heart and lung action. A slack-loined horse is more or less "soft," and a tucked-up barrel, sometimes termed "herring-gutted," also betokens lack of stamina. Ample girth, depth through the loins, and fullness at the flank all favour constitution.

It is not an uncommon thing to see a "washy" horse which is big in the barrel, but which with stress of work soon falls away in condition and exposes his true type with a lightness about the girth and loin. A fleshy

heavy head, should not be favoured; while, on the other hand, a lean head, wide in the cheek, with a good space between the branches of the lower jaw, denotes constitution, as also does the bright, lively eye, and quickly moving forward ears.

Weight and substance with a good top and quality of feather are required. The condition of the skin must be closely examined.

A good temper and kind disposition invariably accompany intelligence and good manners.



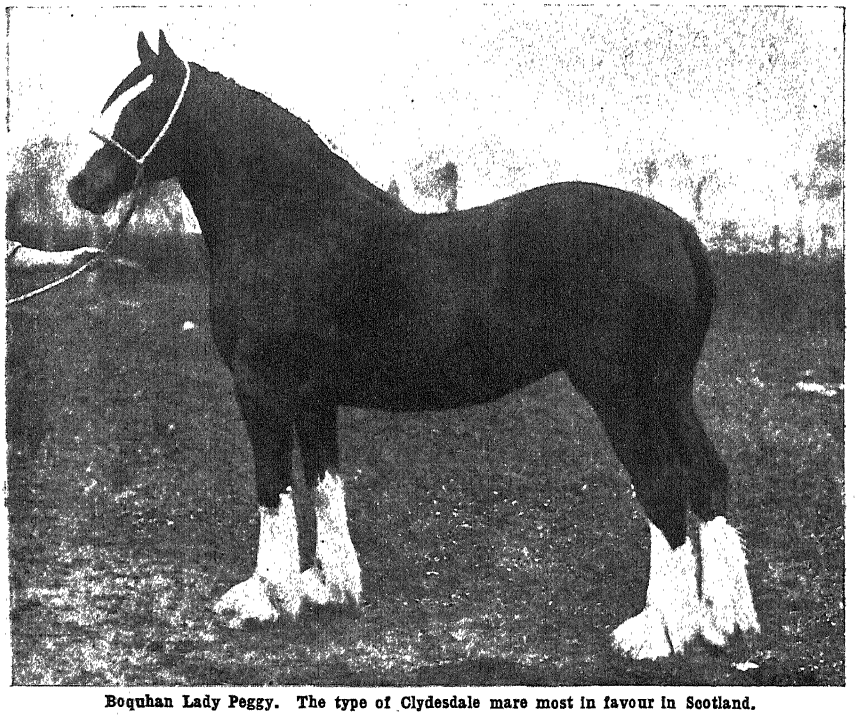
Baron Ashvale. A typical Clydesdale Stallion.

An examination of the legs, for durability, must not be overlooked, and should result in the discovery of clean, flat bone, with tendons distinct, free and clear from the bone. Sloping pasterns of medium length are desirable. The closest scrutiny should be made of the structure of the foot—a firm, wide heel, strong, horny crust, healthy frog, and level placing must be shown.

A general overhaul of the animal in the action of walking and trotting affords the opportunity of estimating his character, and many features that it is impossible to outline, also aid in arriving at fairly sound conclusions. A prominent breeder states that "we should not select as a result of the animal possessing some specially good quality, but rather select him from the absence of faults and the general accumulation of harmonious and worthy

qualities in disposition, conformation and stamina." The exaggerated development of any single meritorious point is not compensation for some flagrant deficiency.

Performances or exhibition in the show ring do not always afford the most reliable evidence of a sire's capacity for leaving sound stock, but these, in conjunction with the proved excellence of his stock, are the best guarantees to owners of mares. It is only necessary to review the show records of those sires well known in the Hawkesbury district, "Plucky Willie" and "Darnley Again," to illustrate this contention. Year after year, these sires



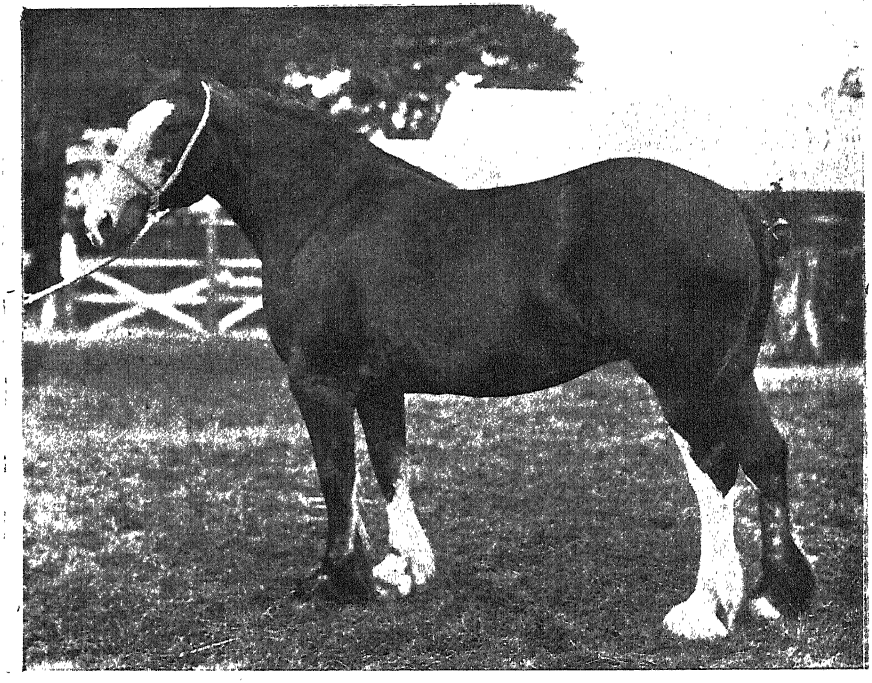
Boquhan Lady Peggy. The type of Clydesdale mare most in favour in Scotland.

have occupied premier places at the Royal Agricultural Society's shows in Sydney. Not only have they scored in the highest positions, but their stock have gained exceptionally high awards in the show ring, and excellent prices at the horse sales. The knowledge of pedigree, stoutness, prepotency, quality, weight, action and other desirable qualifications is thus eclipsed in guiding the breeder by absolute evidence of the very best kind.

No owners of a mare should hesitate to pay a reasonable fee for the services of a pedigreed sire, that is sound in sight, limb and foot, and that possesses a certificate of registration, and a good local reputation. It is at this stage that a farmer should exhibit enough courage to resist the blandishments of he man with a cheap, unregistered stallion, and by so

doing he is rendering yeoman service to his country. The complete exclusion of unregistered stallions would prove an immense gain to our farming community.

Farmers have the settlement of the difficulty in their own hands, and they can approach it with the knowledge that an inferior colt got by a cheap, unsound sire, costs as much to feed and rear as a pure-bred. The latter will always repay a reasonable outlay on service fees. It is a wise expenditure, even if the mare has to be sent some distance to a reputable sire.



Pyrene, another first-class Clydesdale mare.

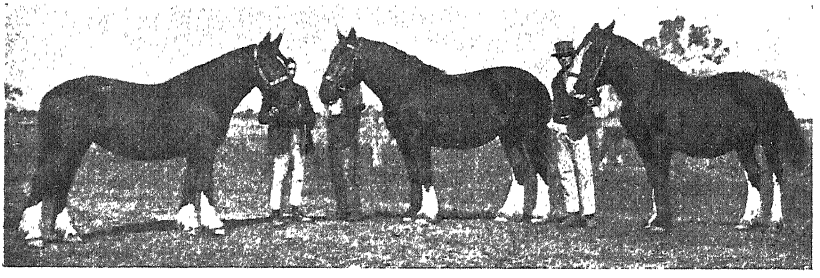
The Influence of the Mare.

There is diversity of opinion amongst farmers as to the age at which a mare should first be stinted. Happily, adverse criticism has met the practice of putting an immature two-year-old filly to the sire, for it is unreasonable to expect a young mare of that age, whilst still growing, to assume the additional task of producing a foal, as both mother and foal must suffer in development. It appeals to any fair mind that the most rational practice is to wait until the animal's body and functions are fully matured and her growth complete. The earliest age recognised is from three to four years, but some discretion must be exercised in each case, seeing that certain fillies are precocious and mature quickly, whilst others are slow.

Neither is it always advisable to breed from old mares, seeing the result is often disappointing. Occasionally it happens that a farmer works a mare continuously until she gives evidence of being worked out. She is then looked on as only fit to turn out and breed from. This class of mare is not altogether satisfactory. It often happens that she fails to secrete enough milk to nourish a foal; at other times the foal is a weakling and hardly worth rearing; and again, difficulties in foaling often present themselves owing to the hardened or atrophied condition of the muscular mouth of the womb.

Successful breeders invariably select young, vigorous mares for stud purposes.

A mare is always sexually more fit for service and in the best condition for impregnation when she has been given regular work during the previous winter, for when kept in idleness there is a possibility of an infertile service, or (if put in foal) the progeny is not vigorous and sturdy.



Three Mares by Plucky Willie, dam Florrie—Violet, 4 years; Beauty, 3 years; Thelma, 2 years. Bred at Hawkesbury Agricultural College.

The selection of a mare for breeding purposes is to some extent controlled and determined by local conditions, combined with the circumstances of the owner, and in order to ensure good stock it is advisable to be guided by some general principles.

We recognise that grade mares are useful to breed from. Frequently our necessities give us no other option, but, however much the limitation is to be deplored, the best should be made of the situation, and only the cream of those available set apart for breeding purposes. We all readily admit the need for more pure-bred mares of the right type, soundness and conformation, because from these only can be produced pure-bred stallions, suitable for our requirements. Pure-bred mares pay handsomely for their keep, both in their work on the farm and in the excellence of their foals, and inquiry is therefore as essential to success as discretion in selection. It is not enough to have a mare of good quality and stoutness with a local reputation. More remote evidence in relation to breeding, type, and pedigree on both sides for at least three generations should be available as a safeguard against the intrusion of some defect or objectionable characteristic in the progeny.

Deficient heart and lung action, weak sight and ill temper in the foal are often traceable to the mare. She should be roomy, staunch, of even temper, gentle disposition, with strong maternal instinct, and a reputation for being good in the collar and quick in moving. Sluggish mares transmit their objectionable habits.

In connection with freedom from hereditary disease or unsoundness, it may be specially emphasised that it is of great importance to the owner to have the mare examined by a qualified veterinary surgeon to determine whether or not either of these defects are present in any form. At the same time appearances often mislead the best judges, for splendid stock have been bred from mares showing no special fitness, though evidently possessed of a capacity for transmitting vigour and quality.

A brief inspection of the future mother should include a keen examination of the way she stands. Correct balance on the ground, standing, walking or trotting, with even movement, is essential, for balanced action is the source of a mare's ability to do a long day's work and to come home comparatively fresh, showing the minimum waste in power. Any tendency to awkward pace, or abnormal spreading of the feet inwards or outwards, means unusual wear, and early suspension from work. The shoulders contribute in no small degree towards the perfection of balance, and enable the animal to walk and trot with level, active carriage, and game, even movement, and they should be fairly oblique and broad.

Symmetry, quality, stamina, stoutness and substance are to be estimated, as well as character and staunchness. The short ribs and hips should not approach each other closely. Roominess is gained by broad and prominent pelvic bones, with width across the loins. The udder, or mammary glands, should be firm and well shaped, and should have clearly defined teats. Vigorous heart and lung action is evidenced in the angle and space of the girth, and size of the chest. The ribs should be well sprung, enclosing a capacious barrel.

The legs should be well moulded from the forearm and thighs downwards, terminating in sloping pasterns, and sound, round, wide feet. The knees should be broad and massive, and the hocks well placed, firm and clean.

The lean, fine head, soft but quick intelligent eye, with active ears, are indications of a good disposition.

Causes of Sterility.

Shy breeders among mares occasionally create some concern. It is claimed, with some evidence to support the contention, that the higher the breed in the scale of purity, the more irregularly does the animal produce its young, and that mares leading a natural life are more certain foal-getters than those fed and housed under artificial conditions. Darwin points out that "any sort of change in the habits of life of an animal, provided it be great enough, tends in some way to affect the power of reproduction." In countries where housing and stall feeding are practised this may, to a certain extent, attain in horse-breeding, but in Australia, owing to constant and abundant sunlight

even temperatures, excellent natural pasturage, and open spaces, we have advantages that induce sexual fertility, and lessen the percentage of barren mares. This is not necessarily a constant factor, however, for the droughts by which we occasionally are visited, with their attendant deficiency of succulent feed, bring about a shortage of foals.

It is also claimed that irregular breeding in mares runs in certain lines of blood. Marshall states:—

> It is well known that the fertility of animals which are much inbred is often reduced, but it is by no means invariably the case. Thoroughbred horses are often inbred, and it is interesting to note that in one of the earlier reports of the Royal Commission on Horse Breeding in England, it is shown that no less than 40 per cent. of the thoroughbred mares in the country fail to have foals each year.
>
> This relatively large amount of sterility is probably due to a variety of causes, and not entirely owing to the results of inbreeding.

It is pointed out by Ewart, that mares abort most freely from the sixth to ninth week after conception, but it is most difficult to ascertain how many cases of failure to foal are due to this trouble.

In animals which, as a general rule, breed freely in a state of domestication or under confinement, it is probable that nutrition plays the chief part (though by no means the sole part) in regulating the capacity to produce offspring. That an insufficient or marked abnormal diet must affect sexual power is almost self evident. An excessive diet, tending towards producing a fatty condition, is likewise prejudicial to the proper discharge of the reproductive functions. As example of the way in which over-feeding results in a condition of sterility, the barren Shire mares which, in recent years, have been a striking feature at agricultural shows in England may be quoted.

Definite figures are not available to show to what extent mares are sterile, especially during droughts, but those made available by the Horse Breeding Commission in England may be quoted to illustrate the position. This commission controlled the expenditure of £40,000 per annum for the King's Premiums in the breeding of light horses. During the six years, 1900 to 1905 inclusive, 9,230 mares were mated with the King's Premium stallions, and during that time the highest percentage of foals was 59, which was reached in 1903 and in 1905. The lowest percentage of foals was in 1900, when it fell as low as 52 per cent.

It has to be remembered, however, that the failure to produce a high percentage may be due to defects in the sires. In round numbers, in the six years under review, there were close upon 5,000 foals by Premium stallions, or a fraction over 54 per cent. In the year 1905, we find the percentage of foals ranging from 33 per cent., credited to the sire "Sunborne," to 88 per cent. credited to the sire "Battlement." Twelve of the twenty-eight Premium Stallions left from 65 to 88 per cent. of foals. In the service season of 1911, fifty King's Premium stallions served 3,245 mares, an average of 65 mares per stallion. Of the 3,245 service fees paid, eighty were in respect of trials; and out of the 3,165 maresactually covered no information

could be obtained of the results of the service of 245. The particulars of foaling for the remaining 2,920 mares show that 1,567 foals were dropped, giving an average percentage of foaling of 53·66.

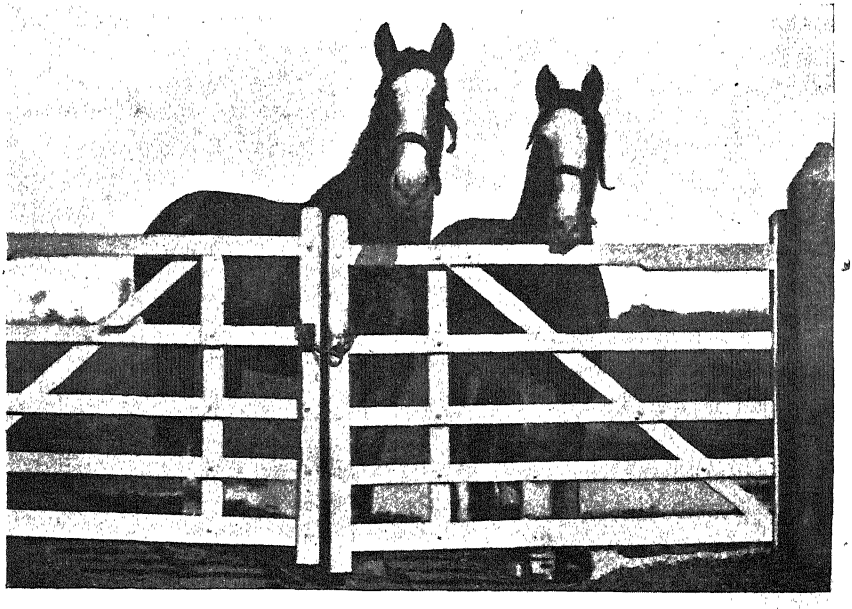
From this series of figures, we may summarise the results as "one foal to two mares served." In Australia, it is considered a fair average if 60 per cent. of foals are dropped amongst draughts.

Some information may be derived from the records kept at the Hawkesbury Agricultural College, showing the services and foal results each year. It may be mentioned that the mares were mated each year with sires selected from those available in the district :—

Date.	Mares Served.	Result.
1905	21	12 foals.
1906	25	16 „
1907	24	17 „
1908	22	13 „
1909	23	11 „
1910	24	12 „
1911	23	14 „

It will be seen that in seven years the percentage of foals was 58·6.

To the mare is attributed the power of impressing her foal with vigour to the internal organisation, such as the functions of digestion, breeding, endurance, disposition, and constitution. In the case of a draught mare, ability to throw a good foal depends largely upon breeding, management, feeding and soundness.



A Snapshot—Clydesdale at the Hawkesbury Agricultural College.

Œstrum in Mares.

The stinting season for Australia ranges from September to December, the aim being to arrange for foaling when frosts are over, climatic conditions favourable, and succulent grazing abundant and suitable.

According to Fleming, the mare will copulate with greater certainty of success on the ninth day after parturition (foaling) than at any other time. Mares failing to conceive on the ninth day usually come well in season on the twenty-first or thirty-first day after foaling. Complete service has been efficient on the forty-second day, and as late as the sixtieth day, after foaling. The pro-œstrum, or progressive stage, is recognised by horse-breeders as coming on heat, or coming in season. The climax to this is termed œstrous, œstrum, or horsing. This is the period at which conception is most certain. The external signs indicating this series of conditions, and marking the first period of the power in the filly, or mare, to procreate, are undue restlessness and excitement ; the udder becomes congested and swollen where there is no foal at foot. Occasionally in the case of a foal suckling, the character of the milk is changed and the foal suffers from scours, or diarrhœa. There is slight swelling, congestion, and reddening of the external organs of the uterus, the vagina and vulva, in which are frequently noted spasmodic movements. There is more or less oozing from the genitals of a mucous or glutinous secretion, or reddish coloured discharge, characterised by a peculiar odour, which attracts the sire. The mare frequently gives vent to peculiar cries and whinnies, gets excited, occasionally gets out of hand, and in the hands of inexperienced attendants becomes dangerous. Often she refuses to eat, and exhibits vagaries of an hysterical nature.

These symptoms last, in varying degrees of intensity, from five to seven days.

The cessation of these symptoms (horsing) and failure of their recurrence are usually accepted as a sign of conception. If the mare refuses the stallion for a month, and her general condition becomes normal she is probably pregnant, but in very exceptional cases a pregnant mare has been known to accept service a second, and even a third time. The mare, after conception, becomes unusually docile and gentle. She is inclined to become fat, and shows an indisposition to do active work.

Occasionally a mare will fail to exhibit any definite symptoms of sexual heat, and to finally settle the possibility of its existence the best thing to do is to take her into the presence of a stallion, and he will soon ascertain.

A mare may be too fat, or in too high condition, to conceive ; but, on the other hand, under-fed animals fail to get in foal. Others again, living under unusual conditions, such as drought, fail to breed. In odd instances a mare will be found to take an unaccountable dislike to a stallion, and to refuse to be stinted. This has been overcome by a change of sires.

The Mare in Foal.

As the period of gestation varies in individuals, and sometimes in the same mare in successive periods, no one can state with reasonable preciseness when foaling will take place.

The approximate period is usually stated at 11 months, or 330 days; but this is by no means constant, and it may be most safely stated that it will vary from 322 to 346 days. In extreme cases foaling has been delayed until 400 days have elapsed, and first pregnancies often last a year. Where parturition is delayed it is often accepted as an indication of a male foal.

A farmer who, in his anxiety to give intelligent care to the mare that he believes is in foal, wishes to register the earliest symptoms of pregnancy, should on the cessation of œstrum or heat, note any enlargement of the abdomen three or four months after, although this is not always noticeable, particularly with fillies. A slight falling beneath the loins and hollowness of the back may be present, or the udder may be observed to change in shape, becoming rounded, firm, and free from wrinkles, and the teats more prominent. These changes in the udder come and go during the period of gestation. A steady increase in weight daily after the fourth or fifth month is a sound indication, as well as the swollen and reddish state of the vaginal mucous membrane. After the seventh or eighth month the movements of the foal may be detected by the hand or fist being pressed firmly against the abdominal wall in front of the left stifle. An examination after the mare has had a drink, or during feeding, will find the foal moving in the womb.

Treatment during the period of gestation must be directed on common-sense lines. A draught mare may be given steady work up to within a few days of foaling—in fact, she is all the better for it—but a walking pace should not be exceeded, and any strain or strenuous effort should be avoided, especially as the period of foaling approaches. Shaft work is generally associated with the possibilities of accident or over-exertion, and should be discarded. If a mare is a noted sweater, then over-exertion should be avoided, seeing its continuance may interfere with milk secretion.

A liberal supply of sweet food of good quality is needed during the whole period of gestation, and should be steadily increased towards the end of the period, for the foal is daily increasing its demands for nourishment—a fact that has to be remembered when feeding. Furthermore, increasing activity is noted in the udder, where milk is being secreted for the foal, and a class of food likely to stimulate milk production is required at this stage, especially lucerne.

The bowel discharges require to be watched, and constipation corrected by bran mashes and green food.

The main diet has to be arranged in order to meet the demands of mother and foal.

Good chaff and a little grain, and other foods rich in those elements which form flesh and bone, may be required to supplement grazing. Lucerne is always a useful adjunct to any ration, not only because it affords protein for flesh formation, but also because it stimulates the flow of milk.

Towards the latter portion of the period of pregnancy the muscles of the hind quarters fall away from the buttock, and a shrinkage of the hind quarters and flanks becomes evident.

Care should be exercised to avoid any class of work entailing excessive fatigue or sudden movements, also jerky exertion.

It may safely be laid down as a rule to work draught mares to within a fortnight of their expected time of foaling.

In this country, where the climate is so propitious, and sunlight with its healthy influences so much in evidence, mares are allowed to foal in clean, well-grassed paddocks, in which are shelter, shade, and a good water supply. Precaution should be taken to see that the mare is not disturbed, and she is best alone, for the presence of other horses often creates undue apprehension.

The ordinary symptoms of approaching parturition are familiar to most breeders. The abdomen becomes more pendulous, the udder enlarged, the teats thickened and extended, and the muscles of the croup less prominent, while the lips of the vagina enlarge and appear slightly parted. Often there is a viscid discharge. The waxy substance found on the opening to each teat drops off about twenty-four hours before foaling, and milk may flow from each teat on the application of pressure. At times the teats do not fill until after foaling. Sometimes the wax on the teats is absent; and yet again in other cases the usual symptoms of milk formation in the udder are delayed until after foaling.

When the time approaches for foaling the mare becomes excited and uneasy. Lying down, elevating the tail, and straining, are all marked symptoms of pains. These become more frequent until the climax is reached.

Natural parturition is rapidly and easily accomplished. A mare may be seen grazing comfortably, and on revisiting her half an hour later she may again be found complacently grazing, but this time with her foal at foot.

It is well to give the mare at least one bran mash daily for two or three days, the aim being to avoid giving her any class of dry food likely to cause constipation. The after-birth, which as a rule is naturally ejected in from three to eight hours after giving birth to the foal, should be buried or burnt.

A New Weed for New South Wales.

Recently a new weed, allied to the Bathurst Burr, made its appearance on a travelling stock reserve near Jerilderie. Its botanical name is *Xanthium ambrosioides*, Hook. and Arn., and it is a native of Chili, in South America.

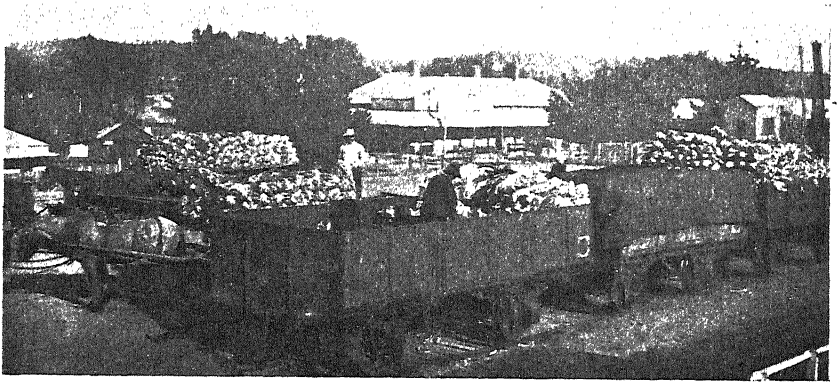
The resemblance of its burrs and its spines to those of the Bathurst Burr is obvious to the most casual observer, but the present plant is prostrate, and it has small, deeply-cut, hairy, grey foliage.

The pest has been eradicated from the place at which it was first found, and all the plants burnt, but it promises to be such a serious one to the wool grower that people should be on the look-out for it, and it would be very interesting to trace how it got to its present situation, with the view, of course, of preventing such an occurrence in the future.—J. H. Maiden.

Cauliflowers in the Bathurst District.

R. W. PEACOCK, Manager, Bathurst Experiment Farm.

THE growing of cauliflowers for sale in the Sydney market has become a very important industry throughout the Bathurst district. Large areas of the rich alluvial soils along the banks of the Macquarie, Campbell's and Fish Rivers, and also along the Vale Creek, are devoted to this crop. Upon these areas a few years ago, lucerne, maize, and tobacco were the main crops. The profits from cauliflower culture were first demonstrated by Chinese, and the industry was afterwards taken up by Europeans, until at present the larger

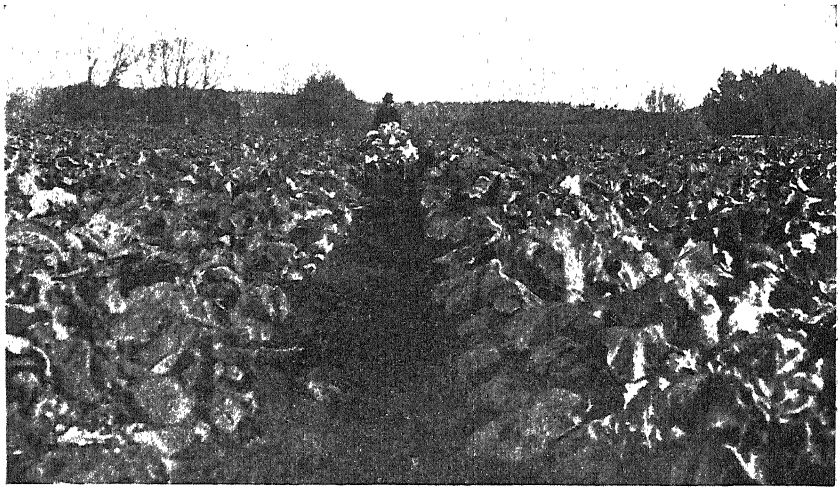


Trucking Cauliflowers, Perthville.

area is cultivated by the white man. The crop is not so exacting as the mixed gardening propositions, and this, together with the prospects of very high returns when conditions are favourable, has appealed to the ordinary farmer. Upon the alluvials of the above rivers where the free water level ranges from 15 to 25 feet below the surface, irrigation plants are installed to tide the plants over any dry period calculated to check their growth. Such irrigation is essential for the stability of the industry upon these areas. There are other areas worked by the more speculative where such provision has not been made, and during the past season it has not been wanted, owing to timely autumn rains. Upon the light silty alluvial of the Vale Creek, in many places free water is obtained by sinking only a few feet, from 5 to 10, and the silt is of such a nature which allows the water to ascend freely by capillarity, and in addition the areas are occasionally flooded. Here, irrigation is not practised, the seedlings at transplanting being watered, if necessary, from

wells which are readily and inexpensively sunk. The most serious disadvantage of this area, as compared with those requiring irrigation, is the liability to flooding before the crop is harvested, and considerable losses are sometimes occasioned when floods occur.

The lot of the cauliflower grower is not always a happy one, and his worst troubles are the possibility of extreme dry weather at transplanting time, the ravages of the cabbage moth larvæ, aphis, cutworms and Rutherglen bug, and the obtaining of low prices. Faulty seed sometimes occasions considerable loss, as inferior strains do not flower satisfactorily. During some years large areas may almost completely fail, due to any or a combination of any of the causes mentioned. Notwithstanding all this, the extreme profits of some seasons more than counterbalance the drawbacks, and the industry is firmly established. During this season the conditions have been



Cauliflowers at Campbell's River Lagoon.

kind, combining in the production of excellent crops, for which good prices, so far, have been obtained. Prices for the early cauliflowers have reached as high as 12s. and 14s. per dozen in Sydney. A large number have sold at 7s. and 8s. Some inferior consignments sold as low as 2s. per dozen. Since the floods in the Eastern districts, the market has hardened, and high prices are again the rule. The number of plants per acre ranges approximately from 4,000 to 5,000, and allowing for the failure of some seedlings, and a percentage of unmarketable plants, which is small this season, the profits are decidedly satisfactory. Returns this year have ranged considerably over £100 per acre. One farmer obtained this figure on trucks at Perthville, when the price averaged 7s. 6d. per dozen in Sydney. Individual farmers crop an area up to 25 and 30 acres.



Cauliflowers in field, cut and ready to carting.

In marketing their produce, Europeans frequently follow their consignments to Sydney, to watch their interests. A quarterly railway ticket from Perthville can be purchased for £5 2s. 9d. It is from this station that the largest quantities are trucked; considerable quantities are also forwarded from Bathurst and Kelso. It is anticipated that fully 2,000 tons will be despatched from Perthville this season, which will constitute a record. In 1911, 1,805 tons were sent through, and 1,300 tons for 1912 season. There are approximately 18 to 20 dozens in a ton, depending upon size. So far, there appears to be no likelihood of over-production as, it is stated, the prices obtained are advancing each year. For details of their cultivation and combating of diseases and pests, those interested are referred to Farmers' Bulletin, No. 68, by A. J. Pinn, which is supplied farmers gratis, upon application to the Department.

Sheep at Moss Vale.

A CORRESPONDENT recently asked if sheep would do well to fatten or rear for wool in the Moss Vale district, using the Lincoln-Merino. The Sheep and Wool Expert in his reply said that the Lincoln-Merino is a very good cross for fattening purposes, provided the pastures are good, and fairly well drained. In most coastal districts, however, the Romney Marsh has proved the most suitable breed; it develops earlier than the Lincoln cross, and, besides resisting disease better than most breeds, it exhibits a hardier constitution, thriving on poorer country and lands that are swampy, where the sheep are liable to foot-rot. The necessary accompaniment to the fattening of sheep is to supplement the natural pasture by the growth of fodder crops. Rape grows to advantage in most coastal districts and is a quick fattening crop. The Romney Marsh, while developing early, is also a fairly profitable wool type.

Subsoiling New Orchards with Explosives.

Subsoiling with gelignite is still somewhat in the experimental stage, so far as its efficiency in the preparation of soil is concerned. That it will do the work is beyond question, and no doubt even in the lighter mountain soils, the deepening and fracturing of the soil by means of an explosive should prove of advantage, from the fact that a greater depth for the plants to root in is made available. Further, great advantage would be gained from the admission of a larger amount of air to the lower depths of soil, thereby enabling bacteria to thrive.

At the same time, I do not consider that explosives in the place where the trees are to grow would be a substitute for the thorough ploughing and cross-ploughing and harrowing of the ground preparatory to planting. The method is now being tried for several orchards that are to be planted in different parts of the State.—J. G. R. Bryant.

Scent Farming in New South Wales.

From time to time inquiries are received by the Department with regard to the possibility of scent farming in this State, and it has been necessary to reply that it is practically impossible to compete with the South of France in this matter. In confirmation of this view, the report furnished to the Victorian Government by Mr. Charles French, on his visit to London and the Continent, in connection with the Conference Regarding Noxious Insect Pests is of interest :—

As is well known, Nice and Grasse are the centres of the scent production of the Continent—flowers, especially violets, being grown in immense quantities ; the work of picking, &c., being mostly performed by women and girls. This fact seems to me to settle, for the time at least, the futility of endeavouring to run scent farming in Australia on either profitable or commercial lines, the wages in the South of France being exceptionally low, and it would be a matter of sheer impossibility for Australia to compete with such cheap labour. I speak as one who has taken a great interest in the Dunolly Scent Farm in our own State, and I beg to repeat that any further attempts on the same lines and conditions must end in failure.

Additional Skin-irritating Plant.

(For previous references see *Agricultural Gazette*, July, 1912, p. 604.)

The following extract concerning a tree known as *Gingko biloba*, and by non-botanists as Maiden-hair tree because of the shape of its leaves, will be useful. It is one of the most interesting and beautiful of all trees, and has been cultivated a good deal in New South Wales.—(J. H. Maiden.)

Poisoning by Ginkgo.—Several botanists after dissecting the fruits of Ginkgo have developed what appeared to be ivy poisoning. As the juice of the Ginkgo produced an immediate irritation of the skin, it was suspected that the rash which developed the following day was due to this. Later tests proved this to be the case. The poison is in the outer fleshy layer. It does not affect all people, since the gardeners at Smith College and at Mount Holyoke College have never been poisoned by handling the Ginkgo fruits ; but a gardener in Elyria, Ohio, who cares for a fruiting tree in the yard of Mr. William G. Sharp, writes that he is poisoned every fall by handling the fruits. The irritation produced is greater than that of poison ivy, and the infection spreads more persistently, and is communicated from one person to another. Pustules rarely form, however, as in ivy poisoning, but there is a heavy red rash, attended by the formation of welts in severe cases.—Anna M. Starr, Mount Holyoke College, South Hadley, Mass., U.S.A., in *Botanical Gazette*, Chicago, March 1913, p. 251.

The "Iron Age" Potato Digger.

A. J. PINN, Assistant Inspector of Agriculture.

FOR the past few years the cost of harvesting potatoes has been on the increase, due chiefly to the shortage of labour at this period of the year.

The Department have long recognised the want of labour-saving machinery in the potato-growing industry, and with this in view have tested a number of patterns.

The English machines are light in build and simple in construction, the principle being for a broad share to pass under the hills while revolving forks working immediately over the share throw the potatoes to one side. Some machines of this class dig well, but all have the disadvantage of spreading the potatoes (as much as 4 feet in some cases) necessitating longer time in picking up, and a number of the smaller tubers are covered with the loose earth.

Being of the opinion that the American type of digger was better suited to the requirements of Australian conditions, the Department purchased an "Iron Age," which has since been tried at Hawkesbury Agricultural College, and at Crookwell and Millthorpe.



The "Iron Age" Potato Digger at work on the Farmers' Experiment Plots, Crookwell. Variety "Surprise," yielding 4 tons 18 cwt. per acre.

At the College the machine was first tested on the Experiment Plots, in a crop with haulms and summer grass 2 to 3 feet high. The soil was fairly hard and very dry (February). The machine with two horses did the work satisfactorily, leaving the potatoes in a row behind the machine, the tops and weeds being conveyed to one side, leaving the potatoes clean for picking up. The next test was at the River Farm associated with the College, where the potatoes had been planted in an old lucerne field. During their growth the

potatoes were irrigated and the soil was cultivated before it was in a fit condition, thus making it very hard. The lucerne was very thick and was 3 feet high. In this test it was necessary to use four horses. The work of the machine was as good as could be expected, the only trouble being that too many clods came over with the potatoes, but this condition could not be overcome by any machine, being due to faulty condition of the land. Both the above trials were conducted on hilled crops.

At Crookwell the machine did excellent work, digging cleanly and without bruising the tubers, leaving them in a row on the levelled soil. The soil was left in a beautiful condition, doing away with the necessity of ploughing the land for the following cereal crop. The work of picking up the tubers is easier and quicker, as there are no "pot holes" for the tubers to roll into as in the case with hand digging. Where the land was stony the machine brought both stone and tubers to the surface.

The test at Millthorpe was a difficult one, being conducted on the heaviest red basalt soil in the district, and shortly after this winter's heavy rain. The crop was planted somewhat deep and not hilled. The soil was very "puggy," and was too heavy to sift. Under these conditions the machine could not be worked with satisfaction.



The "Iron Age" Potato Digger. Rear view, showing tubers leaving revolving apron and falling on riddle.

Since the above I have witnessed another trial of the same make of machine at Wolseley Park. The soil here was of the red basalt type and was fairly heavy, the test having been postponed from the previous week on account of rain. The crop here was hilled and the machine did good work.

The principle of the machine is for a share to pass underneath the potatoes —the earth, potatoes and haulms passing on a wide elevator. The elevator

is made of cross bars turned up and down alternately, being given a sifting motion by elliptical sprockets.

The earth is sifted back into the furrow from which it was taken, and the potatoes and vines pass over the back of the machine, the latter being separated and conveyed to one side and the potatoes dropped in a row on the soft earth. If the tops are dead and small, the vine separator portion may be left out of action, making the draught easier.

For best results at digging, the rows should not be less than 2 feet 8 inches apart, and should be hilled. At planting time all stumps should be taken out. The advantage of using a digger of this type is that the crop can be harvested before the heavy winter weather sets in, and the dug land after harrowing is in readiness for the planting of a hay crop. Given good working conditions the cost of harvesting should be reduced by half.

Topping the Vine.

The advisability of "topping" vines—like all operations that go under the name of summer pruning—depends on various factors.

The operation consists of cutting the shoots off flush with the top of the stake, but it is a mistake to do it indiscriminately. If all the shoots of a vine are bundled together and cut off with one stroke of a hook at the top of the stake, the tendency must be to disturb the balance of the root and leaf systems, and the very fact that immediately they are cut off a number of side shoots make their appearance is proof that a mistake has been made which the plant is endeavouring to rectify.

The side-shoots certainly provide thicker foliage round the grapes, and therefore more shelter, but they also bring a second crop of grapes, which often is fairly large and, therefore, detrimental to the main crop. I do not believe that topping causes the strength of the vine to go into the grapes; the strength of the vine, on the contrary, finds an outlet in the side-shoots, for nothing goes into the fruit that has not first been elaborated by the leaves.

The vine-growing districts of Australia are all fairly hot, and it is singular that in the districts of Southern Europe, where the climatic conditions are somewhat similar, vines are not topped; and in France the method is confined almost entirely to very cold districts.

Where topping is done in the north of Italy it is always done before blossoming, and the shoots are not all removed at once, but at different times with intervals of eight to ten days, making generally three operations.

Some growers in Australia "top" principally because the shoots interfere at a certain stage with work in the vineyard. In such cases, why not limit the topping to the shoots that have grown too long? At any rate, five joints should be left over the grapes if the shoot carries one bunch, and three joints if the shoot carries more than one.

I should say that in the case of old vines, or of vines not too vigorous, or in districts where long spells of dry weather occur during summer, "topping" may be done, provided it is not done drastically; in the case of very vigorous vines growing in a soil not lacking moisture during summer "topping" will hardly do any good, and may cause harm in the long run.—M. Blunno.

Trade with Batavia.

In the report on the trade of the Dutch East Indies for the year 1912, received by the Minister of Agriculture, from Mr. J. B. Suttor, Commercial Commissioner in the East for the Government of New South Wales, special mention is made regarding the packing and the general handling of fresh fruits. Mr. Suttor states :—

During his recent visit he was specially invited to examine certain of the imports, and had the fact demonstrated to him that, if our people will only pay the desired attention to the market in regard to packing and the general handling of fruits, the market is a very promising one from every point of view—not only for fresh fruits, but also canned and evaporated fruits such as apricots. Western Australian exporters are paying special attention to the fresh fruit business, and their apples, stone fruits, and grapes generally arrive in excellent condition; the grapes especially, being carefully packed in cork chips, and not put in paper bags. Mr. Suttor says he personally witnessed the bunches taken out of the cork chip packing, and was more than surprised to find them in such excellent condition. The cases were also clean, with lids nailed on carefully, and the contents and net weight nicely marked on the ends of each case. A New South Wales case opened in his presence, was one of a consignment of grapes, packed in 1 lb. paper bags, in sawdust. The lids of the cases were not nailed, but simply tied in the old loose fashion suitable for short journeys. The tied lids admitted of a movement, and the escape of the inside packing, the result being that the grapes were not held firmly enough to prevent movement, and were consequently smashed and otherwise damaged in a way very detrimental to sales.

It is, therefore, certain that unless we carefully pack in cork chips, our prospects are not by any means encouraging.

Mr. Suttor's attention was next directed to apples and other fruits, more especially in regard to apples. Of all the consignments to hand, the apples from the Bathurst Experiment Farm were far ahead of anything on the market. A case of Bathurst apples, opened for his inspection, that had been in the cooling chambers for twelve months, was still in excellent condition. Previous consignments from the Bathurst Experiment Farm had all sold at satisfactory prices.

In view of the excellent reputation this Farm has now established, and in view also of the importance of developing our fruit trade in the East, Mr. Suttor hopes and suggests that other exporters may see fit to adopt similar methods of packing, and attractive get-up of the cases.

Field Experiments with Maize, 1913.

Hawkesbury Agricultural College.

A. V. DONNAN, Experimentalist.

In authorising the publication of this report, the Experiments Supervision Committee, under whose direction the experiments are conducted, desire to draw attention to the fact that the results are for two years only, and therefore no conclusions can be drawn. It is felt, however, that the public are entitled to know the results as they are obtained.

In connection with the maize experiments for 1912–13, it is necessary to draw attention to the adverse nature of the season experienced, the character of which will be seen from the rainfall table given below. During September and October heavy drying winds were experienced, and these, combined with the unusually low rainfall (34 points in September and 92 in October) prevented any of the early sown maize from making growth during these months. The attacks of armies of cutworms, plentiful on account of the mild winter experienced, necessitated the resowing of three of the four manurial trials in November. November was favourable, but the three following months were very dry and hot. The 2·18 inches of rain on 24th December occurred in a heavy storm, lasting less than an hour. A further analysis of the rainfall table shows that during the growth of the maize crops there were only three falls of over half an inch, and that after the rain on the 24th December the only appreciable fall before harvesting occurred on the 3rd of February (35 points). The spring and summer of 1912–13 are considered by old farmers in the district to have been the worst experienced for many years.

Rainfall Table.

1912.		Points.		1912—*contd.*		Points.		1913.		Points.	
September	1	4		November	11	34		January	3	3	
	2	12			17	1			4	15	
	3	½			18	26			5	18	
	6	5			19	2			7	2	
	13	2			20	176			11	1	
	14	½			21	2			12	2	
	19	9			22	1			16	14	
	27	1			23	7			17	1½	
			34		24	3			18	2	
					26	5			20	2	
							341		21	11½	
October	5	30							22	½	
	21	9		December	3	5					72½
	22	25			4	24		February	3	35	
	23	6			6	½			6	1½	
	24	14			12	3			7	2	
	25	3			13	18			8	2	
	27	3			20	¼			9	15	
	28	2			21	½			10	3	
			92		24	218			12	1	
					30	6			15	4	
November	9	83			31	2			16	½	
	10	1					277¼				64

EXPERIMENT No. III.—MANURIAL TRIAL WITH MAIZE AND WHEAT.

Block C1, 1912–13, Glebe paddock.

Object.—To determine the most suitable and economical source of phosphoric acid to use as a fertiliser with wheat and maize crops in the Hawkesbury-Nepean district, *i.e.*, to determine the effect of climate upon the availability of the phosphorus in the different commercial phosphated manures.

Fertilisers on Trial.

The following phosphatic manures are being tried :—

(1) Bone-dust.
(2) Superphosphate.
(3) Rock phosphate.
(4) Bone char.
(5) Thomas' phosphate.

Note.—The nitrogen content of the soil will be maintained by green manuring, the potash content by the application of sulphate of potash. As bone-dust contains in addition to phosphoric acid, an appreciable amount of nitrogen, all other plots, except that which is unmanured, will receive an equivalent amount of nitrogen in the form of dried blood.

Rotation Employed.

The rotation extends over three years, and is as follows :—

October A—April B—maize.
April B—November B—rape.
November B—March C—fallow.
April C—November C—wheat.
December C—April A—cowpea.
April A—September A—fallow.

Thus every eighteen months the crops will be cowpea, fallow, maize—rape, fallow, wheat. In a complete rotation the specified phosphatic manures are tested on the two staple crops—wheat and maize.

Soil.

The soil consists of a clayey loam, which has been much improved in texture by the cultivation and green manuring already followed out in the experiments.

Previous History.

Prior to being taken over for experimental work the ground was uniformly cropped with wheat and oats. Since experimental work began in 1911 the following crops have been grown :—

May–October, 1911—wheat.
February–May, 1912—cowpea.

Preparation for Planting.

The cowpea was turned under in May, 1912, and the ground fallowed during the winter. In July heavy rain fell, and on 12th and 13th August the ground was harrowed. The land was again ploughed and harrowed from the 1st to the 9th September, being then ready for sowing.

Fertiliser.

The fertilisers were sown over the harrowed ground on 19th September. The fifteen disc wheat drill was used for sowing, each manure being made up

to 50 lb. weight with fine earth and distributed evenly at the highest speed of the drill, 2 to 3 inches deep. The amount and character of the manures applied may be seen in Table A.

The various manures were sown in such quantities that phosphatic fertilisers supply 20 lb. of phosphoric acid per acre, potassic fertilisers supply 7½ lb. potash per acre, while nitrogenous fertilisers supply per acre the equivalent of the N contained in the bone-dust applied to Plot No. 2.

Dimensions and Arrangement of Plots.

As shown in Table A, each plot is 16 links by 10 chains. Across the whole block maize is sown in rows 5⅓ links apart, so that the first and every third row lie on a dividing line between two plots. Thus in each plot there are sown two rows of maize, 5⅓ links apart and 10 chains long.

Plan ng.

The experiment was sown on the 26th and 27th of September. The ground was rolled and drilled 4 to 5 inches deep, and the seed sown with a single horse corn-dropper. Single grains were sown at spaces of 12 inches, and 1½ to 2 inches deep in the drill. Seeding was at the rate of 12 lb. per acre.

Variety of Maize Sown.

One variety, Red Hogan, was sown over the whole area.

Germination.

The crop germinated well. In October, however, when the plants were a few inches high, travelling cutworms killed out the whole block, despite all efforts to prevent them from doing so.

Resowing.

The crop was resown on 13th November by sending a light plough along each drill and turning up an inch of the bottom soil. In the freshly opened drill Red Hogan maize was sown in the same way as before, *i.e.*, with the corn-dropper. As the soil was fairly dry at sowing, thicker seeding was followed, and 18 lb. of grain were planted per acre.

The second crop germinated well and made fair growth during the rest of November and December. During the succeeding dry spell, however, the crop failed to make any growth, and by the end of January had tasselled. Beyond the fact that toward the end on which plot No. 10 was situated the crop had germinated better and grown thicker than elsewhere, no difference could be seen in the growth.

After-Treatment.

The crop received the following cultivation during growth:—Harrowed on December 6th, 1912. Cultivated with a two-horse spring-tooth cultivator on 5th January, and again on 13th January, 1913.

Harvesting.

At harvesting, all those rows lying on the boundaries of the plots (one row in every three) were discarded. From the remainder a length of 31·25

links from each end was cut and discarded, and the rest harvested for comparative purposes. Thus from each plot two rows, each 937½ links long, representing an area of $\frac{1}{10}$ acre, were harvested. The experiment was cut by hand on 27th and 28th February, and 1st March, and was weighed immediately after cutting. The maize stalks were weighed on a platform scales drawn on a slide. The yields are given in Table B. Percentage results up to date are given in Table C.

Conclusions.

No conclusions can as yet be drawn from the results of this experiment.

The average results of the two tests with maize crops, each of which was grown in a very bad season, shows practically no difference due to manuring with the different phosphatic fertilisers. On the other hand all the phosphatic fertilisers, except Rock Phosphate, have given increased yields in the averages of the wheat crops.

TABLE A.—Showing arrangement and dimensions of, and the fertiliser sown on, each plot.

Width of Plot=16 links. Length of Plot=10 chains. Area harvested=$\frac{1}{10}$ acre.

	BUFFER (20 links wide).	
		lb. per acre.
1. (*Check.*)	Blood	27
	Sulphate of potash	14·5
2.	Sulphate of potash	14·5
	Bone-dust	91
3.	Blood	27
	Sulphate of potash	14·5
	Superphosphate	118
4. (*Check.*)	Blood	27
	Sulphate of potash	14·5
5.	Blood	27
	Sulphate of potash	14·5
	Rock phosphate	62·5
6.	Blood	27
	Sulphate of potash	14·5
	Bone char	66·5
7. (*Check*)	Blood	27
	Sulphate of potash	14·5
8.	Blood	27
	Sulphate of potash	14·5
	Thomas' phosphate	118
9.	Unmanured.	
10. (*Check.*)	Blood	27
	Sulphate of potash	14·5
	BUFFER (20 links wide).	

← ....10 Chains. ....→

TABLE B.

Table B shows results obtained from maize crop of 1912–13. Only the distinguishing phosphatic fertiliser is shown on each plot, the complete fertiliser for each plot being shown in Table A.

TABLE C.

Table C shows the percentage yields from all the crops taken off since this experiment began.

Distinguishing Phosphatic Fertiliser.	Yield per Plot.	Natural Yield per Plot.	Yield per Acre.	Natural Yield per Acre.	Percentage Yield.	Percentage Yields.			
						Wheat, 1911.	Wheat, 1912.	Maize, 1911–12.	Maize, 1912–13.
	lb.	lb.	t. c. q. lb.	t. c. q. lb.					
(1) *Check*	663	663	2 19 0 22	2 19 0 22	100	100	100	100	100
(2) Bone-dust	632	665⅓	2 16 1 20	2 19 1 18	95	132·2	160·8	103·7	95
(3) Superphosphate	666	667⅔	2 19 1 24	2 19 2 13	99·7	254·7	180·1	99 2	99·7
(4) *Check*	670	670	2 19 3 8	2 19 3 8	100	100	100	100	100
(5) Rock Phosphate	677	700⅔	3 0 1 22	3 2 2 7	96·6	72·3	122·7	102	96·6
(6) Bone Char...	783	731⅓	3 9 3 18	3 3 2 2	107·1	124·4	165·9	97·5	107·1
(7) *Check*	762	762	3 8 0 4	3 8 0 4	100	100	100	100	100
(8) Thomas' Phosphate	801	766⅓	3 11 2 2	3 8 1 20	104·5	201·6	180·0	94·4	104·5
(9) Unmanured	834	770⅔	3 14 1 24	3 4 3 7	108·2	161·2	117·5	106·2	108·2
(10) *Check*	775	775	3 9 0 22	3 9 0 22	100	100	100	100	100

Average yield per acre, 3 tons 4 cwt. 3 qrs. 11 lb.

EXPERIMENT No. IV.—MANURIAL TRIAL WITH MAIZE.

Block C3, 1912–13, Glebe paddock.

Object.—To determine the effects upon the yield of staple crops of the application of simple and mixed fertilisers when applied at the same time that the crop is planted, *i.e.*, directly with the staple crop, and to soil in which the fertility and the supply of organic matter are kept up by a suitable rotation.

Fertilisers.

The following fertilisers are being tried, singly and in combination, with the maize crop in the rotation (see rotation adopted, Experiment No. III) :—

(1) Superphosphate to supply phosphoric acid.
(2) Sulphate of potash to supply potash.
(3) Sulphate of ammonia to supply nitrogen.

And a mixture of sulphate of ammonia, superphosphate and sulphate of potash is compared with a mixture of dried blood, superphosphate, and sulphate of potash to determine whether the organic form of nitrogen can replace the sulphate. (These fertilisers are shown in Table A1.)

When in the course of the rotation cowpeas are planted, each plot receives with this crop fertiliser complementary to that applied with the maize crop. These fertilisers are shown in Table A2. Thus in the course of one complete rotation each plot receives a complete manure. To further even up the ground 1 cwt. of superphosphate is applied to the rape.

The quantity of fertiliser at each application is applied on the following basis :—

Phosphatic manures to supply			20 lb. P_2O_5	per acre.
Potassic	„	„	15 lb. K_2O	„
Nitrogenous	„	„	6 lb. N	„

The following points have been already dealt with in Experiment No. III :—

(1) Rotation employed.
(2) Soil.
(3) Previous history of soil.
(4) Dimensions and arrangement of plots in the block.
(5) Preparation for planting.
(6) Variety of maize sown.

Sowing Fertilisers.

The fertilisers were sown over the harrowed ground on 18th September These manures were sown in the manner described in Experiment No. III, and are shown in Table A1.

The complementary manures shown in Table A2 were sown in the same way on 6th February, 1912, the block being immediately afterwards sown with black cowpea, which, as already stated, was ploughed under in May.

Planting.

This experiment was sown on 23rd and 24th of September. The ground was rolled and drilled 4–5 inches deep, and the seed sown with a single horse corn-dropper. Single grains were sown at spaces of 12 inches, and 1½ to 2 inches deep in the drill. Seeding was at the rate of 12 lb. per acre.

Germination.

The crop germinated well and was saved from the attack of the cutworms which destroyed the other experiments by laying baits of poisoned pollard and bran around the headlands and buffers, and by using a roller when the grubs were moving over clear ground.

Cultivation.

The crop was rolled and harrowed on 15th November, and cultivated with a one-mule tooth cultivator on 4th December (twice) and 9th January, 1913.

Notes on Growth.

The crop made very little growth during October, but in November, when conditions were favourable, it grew very well. However, December and January proved dry and hot, and prevented the crop making good progress. During the first week in January the crop tasselled, and a fortnight later flowered and began cobbing. On 2nd January, before tasselling, the crop averaged 5 feet in height, No. 7 plot being the tallest. When in full flower the crop averaged 7 feet high, No. 2, No. 3 and No. 5 being the tallest at 8 feet high.

Harvesting.

As the crop was rapidly going off through adverse conditions the experiment was cut and weighed on the 3rd and 4th February, 1913.

Harvesting and weighing was carried out as described in Experiment No. III. The yields are given in Table B.

Conclusions.

No conclusions can be drawn from the results so far, as each of the two maize crops have been partially spoilt by severe drought which has prevented normal growth.

TABLE A1.

howing the dimensions and arrangement of plots and the fertiliser sown on each plot with the maize crop. The complementary manures sown with cowpea are shown in Table A2.

Length of plot=10 chains.
Width of plot=16 links.
Area harvested and weighed=$\frac{1}{10}$ acre.

	BUFFER (20 links wide).	
1. (*Check.*)	No manure.	
2.	Sulphate of ammonia...	lb. per acre. 30
3.	Superphosphate	118
4. (*Check.*)	No manure.	
5.	Sulphate of potash	29
6.	Sulphate of ammonia... ... ... Superphosphate	30 118
7. (*Check.*)	No manure.	
8.	Sulphate of ammonia... ... ... Sulphate of potash	30 29
9.	Superphosphate ... ... Sulphate of potash	118 29
10. (*Check.*)	No manure.	
11.	Sulphate of ammonia... ... ... Superphosphate ... . Sulphate of potash	30 118 29
12.	Dried blood .. .. Superphosphate ... ... Sulphate of potash	45 118 29
13.	No manure.	
	BUFFER (20 links wide).	

TABLE A2.

Showing arrangement and dimensions of plots, &c., the fertiliser sown on each plot on the rotative crop, cowpea. These manures are complementary to those applied with the maize, so that during one rotation each plot receives the component parts of a complete fertiliser.

Length of Plot=10 chains.
Width of Plot=16 links.
Area harvested = $\frac{1}{10}$ acre.

BUFFER PLOT (20 links).		lb. per acre.
1. (*Check.*)	Sulphate of ammonia ... ... Superphosphate .. .. Sulphate of potash...	30 118 29
2.	Superphosphate ... ... Sulphate of potash...	118 29
3.	Sulphate of ammonia ... . Sulphate of potash...	30 29
4. (*Check.*)	Sulphate of ammonia ... ... Superphosphate ... ... Sulphate of potash...	30 118 29
5.	Sulphate of ammonia ... ... Superphosphate	30 118
6.	Sulphate of potash...	29
7. (*Check.*)	Sulphate of ammonia ... ... Superphosphate ... ... Sulphate of potash	30 118 29
8.	Superphosphate	118
9.	Sulphate of ammonia	30
10. (*Check.*)	Sulphate of ammonia ... ... Superphosphate ... ... Sulphate of potash...	30 118 29
11.	Nil.	
12.	Nil.	
13.	Sulphate of ammonia ... ... Superphosphate ... ... Sulphate of potash...	30 118 29
BUFFER PLOT (20 links).		

TABLE B.

Shows the results obtained and the fertilisers applied to each crop with the maize. Fertilisers applied with the cowpea are shown in Table A2. Average yield per acre, 4 tons 2 qrs. 14 lb.

Fertiliser Applied.	Yield per Plot.	Natural Yield per Plot.	Yield per Acre.	Natural Yield per Acre.	Percentage Yield.	Percentage Yield, 1911–12.
	lb.	lb.	tons cwt. qr. lb.	tons cwt. qr. lb.		
(1) No manure (*check*) ..	766	766	3 8 1 16	3 8 1 16	100	100
(2) Sulphate of ammonia	1,016	782·7	4 10 2 24	3 9 3 15	129·8	86·5
(3) Superphosphate ...	999	799·3	4 9 0 22	3 11 1 14	125	58·5
(4) No manure (*check*) ..	816	816	3 12 3 12	3 12 3 12	100	100
(5) Sulphate of potash ...	739	920·7	3 5 3 26	4 2 0 23	83·8	116
(6) Sulphate of ammonia, superphosphate.	953	1,025·3	4 5 0 10	4 11 2 6	92·9	105·4
(7) No manure (*check*) ...	1,130	1,130	5 0 3 16	5 0 3 16	100	100
(8) Sulphate of ammonia, sulphate of potash.	836	1,058·7	3 14 2 16	4 14 2 3	79	108·9
(9) Superphosphate, sulphate of potash.	878	987·3	3 18 1 16	4 8 0 18	88·9	76·8
(10) No manure (*check*) ...	916	916	4 1 3 4	4 1 3 4	100	100
(11) Sulphate of ammonia, superphosphate, sulphate of potash.	856	866	3 16 1 20	3 17 1 8	98·8	78·1
(12) Dried blood, superphosphate, sulphate of potash.	1,068	816	4 15 1 12	3 12 3 12	131	76·9
(1) No manure (*check*) ..	766	766	3 8 1 16	3 8 1 16	100	100

EXPERIMENT No. V.—MANURIAL TRIAL WITH WHEAT AND MAIZE.

Block C2, Glebe paddock, 1912–13.

Object.—To determine the chemical needs of the soil by the effect upon the yield of staple crops of the district of the continuous application of simple and mixed fertilisers to the same land and soil, in which the supply of organic matter is kept up by a suitable rotation.

Fertilisers.

The following fertilisers are being used :—

(1) Superphosphate to supply phosphoric acid.

(2) Sulphate of potash to supply potash.

(3) (*a*) Sulphate of ammonia to supply nitrogen.

(*b*) The organic form of nitrogen will be contrasted with the inorganic by comparing the yields from plots manured with dried blood, superphosphate and sulphate of potash, and with sulphate of ammonia, superphosphate, and sulphate of potash.

The quantity of fertiliser at each application :—

Phosphatic manures to supply 20 lb. P_2O_5 per acre.
Potassic „ „ 7½ lb. K_2O „
Nitrogenous „ „ 6 lb. N „

The various fertilisers are being applied to the maize and wheat crops in the rotation.

Check Plots.

The check plots, comprising the first and every succeeding third plot in the series, will not be manured in any way.

The following points have already been dealt with in Experiment No. III:—

(1) Rotation adopted.
(2) Soil.
(3) Previous history of soil.
(4) Dimensions and arrangement of plots.
(5) Preparation for planting.
(6) Variety and quantity of maize sown.
(7) Method of applying fertiliser.
(8) Method of harvesting and weighing.

Sowing of Fertilisers.

The various fertilisers were sown over harrowed ground on 18th and 19th September.

Planting.

On 25th and 26th September the ground was rolled, drilled 4 to 5 inches deep, and seed sown through the single horse corn-dropper. Single grains were sown at spaces of 12 inches, and 1½ to 2 inches deep in the drill.

12 lb. of Red Hogan seed were sown per acre over the whole block.

Germination.

The crop germinated well, but suffered the same fate as the crop in Experiment No. III, being eaten completely off by travelling cutworms.

Resowing.

The crop was resown on 12th November in the same way and at the same rate as the maize in Experiment No. III.

After-Treatment.

The crop received the following cultivation during growth:—Harrowed on 5th and 6th December, 1912. Cultivated with a two-horse spring-tooth cultivator on 2nd January and again on 12th January, 1913.

Notes on Growth.

The second crop germinated well and made fair growth during the rest of November and December. The adverse conditions prevailing during January and February severely affected the crop, and by the end of January the crop had fully tasselled at a height of 3 feet.

Harvesting.

This experiment was harvested in the same way as in Experiment No. III on the 26th and 27th of February, 1913. The yields are given in Table B.

Conclusions.

No conclusions can be drawn from this year's result, as the crop was almost spoilt by a very poor season.

TABLE A.

Showing arrangement and dimensions of plots, and the fertiliser applied to each plot.

Width of plot = 16 links.
Length of plot = 10 chains.
Area harvested and weighed = $\frac{1}{10}$ acre.

	BUFFER (20 links wide).	
1. (*Check.*)	Nil.	
2.	Sulphate of ammonia	lb. per acre. 30
3	Superphosphate	118
4. (*Check.*)	Nil.	
5.	Sulphate of potash	14·5
6.	Sulphate of ammonia	30
	Superphosphate	118
7. (*Check.*)	Nil.	
8.	Sulphate of ammonia	30
	Sulphate of potash	14·5
9.	Superphosphate	118
	Sulphate of potash	14·5
10. (*Check.*)	Nil.	
11.	Sulphate of ammonia	30
	Superphosphate	118
	Sulphate of potash	14·5
12.	Dried blood	45
	Superphosphate	118
	Sulphate of potash	14·5
13. (*Check.*)	Nil.	
	BUFFER (20 links wide).	

TABLE B.

Showing fertiliser applied and the results obtained from the various plots.

Fertiliser.	Yield per plot.	Natural Yield per plot.	Yield per Acre.	Natural Yield per Acre.	Percentage Yield.
	lb.	lb.	t. cwt. qr. lb.	t. cwt. qr. lb.	
(1) *Check*—Nil	835	835	3 14 2 6	3 14 2 6	100
(2) Sulphate of ammonia	831	812	3 14 0 22	3 12 2 0	102·3
(3) Superphosphate	692	789	3 1 3 4	3 10 1 22	87·7
(4) *Check*—Nil	766	766	3 8 1 16	3 8 1 16	100
(5) Sulphate of potash	775	788·3	3 9 0 22	3 10 1 16	98·3
(6) Sulphate of ammonia, superphosphate ..	785	810·6	3 10 0 10	3 12 1 15	96·8
(7) *Check*—Nil	833	833	3 14 1 14	3 14 1 14	100
(8) Sulphate of ammonia, sulphate of potash	681	819·3	3 0 3 6	3 13 0 18	83·1
(9) Superphosphate, sulphate of potash ...	531	805·6	2 7 1 18	3 11 3 21	65·9
(10) *Check*—Nil	792	792	3 10 2 24	3 10 2 24	100
(11) Sulphate of ammonia, superphosphate, sulphate of potash	794	769	3 10 3 16	3 8 2 18	103·2
(12) Dried blood, superphosphate, sulphate of potash	795	746	3 10 3 26	3 6 2 12	106·6
(13) *Check*—Nil	723	723	3 4 2 6	3 4 2 6	100

Average yield per acre, 3 tons 7 cwt. 2 qrs. 4 lb. per acre.

TABLE C.

Showing average percentage results to date from all crops harvested.

Fertiliser.	Percentage Yield.			
	Wheat, 1911.	Wheat, 1912	Maize, 1911–12.	Maize, 1912–13.
(1) *Check*—Nil	100	100	100	100
(2) Sulphate of ammonia	96·4	94·2	96·2	102·3
(3) Superphosphate	140	134·1	79·2	87·7
(4) *Check*—Nil	100	100	100	100
(5) Sulphate of potash	106·4	94·1	69·1	98·3
(6) Sulphate of ammonia, superphosphate ..	185·2	139 6	69·1	96·8
(7) *Check*—Nil	100	100	100	100
(8) Sulphate of ammonia, sulphate of potash	101	84·9	77·2	83·1
(9) Superphosphate, sulphate of potash ...	118·7	148·7	66·9	65·9
(10) *Check*—Nil	100	100	100	100
(11) Sulphate of ammonia, superphosphate, sulphate of potash	150·2	150·8	67·3	103·2
(12) Dried blood, superphosphate, sulphate of potash	164·2	140	61·5	106·6
(13) *Check*—Nil	100	100	100	100

EXPERIMENT No. VI.—MANURIAL TRIAL WITH WHEAT AND MAIZE.

Block C2, 1912–13, Glebe paddock.

Object.—To determine the chemical needs of the soil by the effect upon the yield of staple crops of the district of the continuous application of simple and mixed fertilisers with rotative crops to the same land and soil in which the supply of organic matter is kept up by a suitable rotation.

Note.—The only differenc ebetween Experiments Nos. V and VI is that in the former fertilisers are applied to the staple crops in the rotation—wheat and maize—while in the latter they are applied to the rotative crops, rape and cowpea.

Fertilisers.

The following fertilisers are being tried :—

1. Superphosphate to supply phosphoric acid.
2. Sulphate of potash to supply potash.
3. (*a*) Dried blood to supply nitrogen.
   (*b*) The inorganic form of nitrogen is being compared with the organic by comparing the yield from plots manured with sulphate of ammonia, superphosphate, and sulphate of potash, and with dried blood, superphosphate, and sulphate of potash.

At each application the following quantities of fertiliser are applied :—

Phosphatic manures	to supply...	...	...	20 lb. P_2O_5	per acre.
Potassic	„	„	...	7½ lb. K_2O	„
Nitrogenous	„	„	...	6 lb. N	„

Check Plots.

The check plots, comprising the first and every succeeding third plot in the series, are not manured in any way.

The following points have already been dealt with in Experiment No. III :—

(1) Rotation adopted.
(2) Soil.
(3) Previous history of soil.
(4) Dimensions and arrangement of plots.
(5) Preparation for planting.
(6) Variety and quantity of maize sown.
(7) Method of applying fertiliser.
(8) Method of harvesting and weighing.

Sowing of Fertilisers.

No manure was sown with the maize. With the cowpea crop planted from 7th to 9th February, 1912, the fertilisers shown in Table A were applied.

Planting.

On 24th and 25th September the ground was rolled, drilled 4–5 inches deep, and the seed sown through the single horse corn-dropper. Single grains were sown at spaces of 12 inches and 1½–2 inches deep in the drill.

12 lb. Red Hogan seed were sown per acre over the whole block.

Resowing.

This experiment germinated well, but shared the same fate as Nos. III and V, being eaten off by cutworms. The crop was resown on 11th November in the same way and at the same rate as in Experiment No. III.

Notes on Growth.

The second crop, which germinated well, made less growth than, but behaved in the same way as, the crop in Experiment No. V. It made fair growth up to the end of December, but was afterwards spoilt by adverse conditions, having fully tasselled at the end of January at a height of 2 feet 6 inches.

After-Treatment.

The crop received the following cultivation during growth :—

5th and 6th December ...	Harrowed with a set of light harrows.
31st December	Cultivated with two-horse cultivator.
5th January	" " " "
12th January	" " " "

The yields are given in Table B, but no conclusions can be drawn from these results.

TABLE A.

Showing the arrangement and dimensions of the plots and the fertilisers applied to each plot, with the cowpea crop planted in February, 1912. No manure was applied with the maize crop.

Length of Plot = 10 chains.
Width of Plot = 16 links.
Area harvested = $\frac{1}{10}$ acre.

	BUFFER PLOT (20 links wide).		
1.	(*Check.*)	Nil.	
2.		Dried blood	lb. per acre. 45
3.		Superphosphate	118
4.	(*Check.*)	Nil.	
5.		Sulphate of potash	14·5
6.		Dried blood	45
		Superphosphate	118
7.	(*Check.*)	Nil.	

TABLE A—*continued.*

		lb. per acre.
8.	Dried blood	45
	Sulphate of potash	14·5
9.	Superphosphate	118
	Sulphate of potash	14·5
10. (*Check.*)	Nil.	
11.	Dried blood	45
	Superphosphate	118
	Sulphate of potash	14·5
12.	Sulphate of ammonia	30
	Superphosphate	118
	Sulphate of potash	14·5
13. (*Check.*)	Nil.	

BUFFER PLOT (20 links wide).

TABLE B.

Showing Manures applied to the previous Cowpea crop, and results obtained from the Maize crop (unmanured).

Fertiliser.	Yield per Plot.	Natural Yield per Plot.	Yield per Acre.	Natural Yield per Acre.	Percentage Yield.	Percentage Yield, Wheat, 1912.
	lb.	lb.	ton c. qr. lb.	ton c. qr. lb.		
(1) *Check*—Nil	723	723	3 4 2 6	3 4 2 6	100	100
(2) Dried blood	753	698·3	3 7 0 26	3 2 1 12	107·9	88·6
(3) Superphosphate ...	652	673·7	2 18 0 24	3 0 0 17	96·3	91·9
(4) *Check*—Nil	649	649	2 17 3 22	2 17 3 22	100	100
(5) Sulphate of potash ...	534	607·3	2 7 2 20	2 14 0 26	87·9	104·6
(6) Dried blood, superphospate.	522	565·7	2 6 2 12	2 10 2 1	92·3	119·8
(7) *Check*—Nil	524	524	2 6 3 4	2 6 3 4	100	100
(8) Dried blood, sulphate of potash.	638	548	2 16 3 24	2 8 3 20	116·4	100·7
(9) Superphosphate, sulphate of potash.	601	572	2 13 2 18	2 11 0 8	105·1	111·2
(10) *Check*—Nil	596	596	2 13 0 24	2 13 0 24	100	100
(11) Dried blood, superphosphate, sulphate of potash.	524	571·3	2 6 3 4	2 11 0 2	91·7	102·5
(12) Sulphate of ammonia, superphosphate, sulphate of potash.	574	546·7	2 11 1 0	2 8 3 7	105	100
(13) *Check*—Nil	522	522	2 6 2 12	2 6 2 12	100	100

Average yield per acre, 2 tons 13 cwt. 2 qrs. 17 lb.

EXPERIMENT No. II.—MAIZE VARIETY TRIAL.

Block D2, 1912-13, Glebe paddock.

Object.—To ascertain the most suitable varieties of maize to grow for green fodder and for grain under the conditions obtaining in the Hawkesbury-Nepean district.

Dimensions of Plots.

As shown in Table A, each plot is 40 links wide by 10 chains long. In each plot are sown six rows of maize 4 feet apart, leaving a space of 3 feet 2½ inches between each outside row and boundary of the plot. In the block are nineteen plots, the first and every succeeding third plot of which are check plots.

The following points have already been dealt with in Experiment No. III :—

(1.) Rotation adopted.

(2.) Soil and its previous history.

Varieties Tested.

Including the Check variety, Red Hogan, thirteen varieties were planted in the block, as shown in Table A.

Preparation for Planting.

The cowpea was ploughed under in May, 1912, and allowed to lie until August. From then till sowing the block received the following treatment :—

19th–20th August	...	Harrowed.
21st–24th „	...	Disc-harrowed.
11th–13th September	...	Ploughed.
15th–18th „	...	Harrowed.
22nd–26th October	...	Cultivated with spring-tooth cultivator and harrowed, couch grass was then carted off and burnt.
11th November	...	Cultivated deeply.

Planting.

On 13th November sowing began. The land was harrowed, rolled, and drilled 4 to 5 inches deep, and the maize sown 1½–2 inches deep in the drill with the corn-dropper. Sowing was finished on 16th November. The rate of seeding with the various varieties ranged from 6 to 8 lb. per acre.

Fertiliser.

The following fertiliser per acre was applied through the fertiliser attachment of the corn-dropper :—1½ cwt. of a mixture of—

Dried blood ...	...	3 parts.	Superphosphate	...	2 parts.
Bone-dust ...	...	2 „	Sulphate of potash	...	1 „

After-Treatment.

After planting, the crop received the following treatment :—

4th December—harrowed to break crust on ground.

30th–31st December—cultivated with two-horse cultivator.

3rd–5th January— „ „

Notes.

On 20th November, four days after sowing was finished, 176 points of rain fell, causing the bottoms of the drills to become puddled. The crop germinated fairly well, though slowly, but it had received a severe check. It afterwards made practically no growth, and by the 10th February—less than three months from sowing—it was out in head and flowering when only 2 feet high. Many of the plants at this stage were practically dead, and as the whole crop began to die off, all varieties being affected alike, the Principal was consulted and it was determined to abandon the experiment for the year.

TABLE A.—EXPERIMENT No. II.

Showing arrangement of Plots and the variety sown in each Plot.

Width of Plot, 40 links. Length of Plot, 10 chains.

	BUFFER, UNLIMITED.	
1.	Red Hogan.	(*Check*.)
2.	Cocke's Prolific.	
3.	Riley's Favourite.	
4.	Red Hogan.	(*Check.*)
5.	Early Leaming.	
6.	Hickory King.	
7.	Red Hogan.	(*Check.*)
8	Pride of the North.	
9.	Malboro's Prolific.	
10.	Red Hogan.	(*Check.*)
11.	Clarence River Early.	
12.	Shoalhaven.	
13.	Red Hogan.	(*Check.*)
14	Yellow Moruya.	
15	Golden Dent.	
16.	Red Hogan.	(*Check.*)
17.	Yellow Dent	
18.	Golden Nugget.	
19.	Red Hogan.	(*Check.*)
	BUFFER, 20 links.	

Profitable Brood Combs.

R. G. WARRY, Demonstrator in Apiculture.

It has been frequently remarked that the queen bee is everything to the colony, meaning that the finest queen, the most prolific queen, and in many cases the most expensive queen obtainable, is bound to produce the greatest weight of surplus honey once she has been safely introduced to a colony of bees. Certainly, no stock can produce a creditable surplus without a prolific queen at its head; but she, in turn, must not be forced to operate in a brood chamber which does not offer her every facility for keeping up her average day's egg laying.

For the honey producer, there are queen bees available which cannot fail to give a large return in honey in exchange for proper room and opportunities for laying; but, before a queen is introduced to a colony, the brood chamber she is to occupy must contain profitable comb—not merely a small percentage of profitable comb, but practically all of it must be of the right kind.

The brood nest of a colony of bees is the area of comb occupied by the queen for ovipositing, and by the nurse bees for incubating and hatching her eggs, and feeding the developing larvæ. It is in the brood nest that the young bee emerges and takes up its duties. Part of the comb in the brood nest is used for stores, which are thus near to the maturing brood, and can be drawn on by the nurse bees.

As is well known, a colony provides its queen with cells of two sizes (queen cells not being considered)— a small cell in which a vigorous laying queen will deposit a worker egg, and a larger cell in which she will lay a male or drone egg.

The working force of the colony is what is directly responsible for the weight of surplus honey gathered. The two things influencing the working force of a colony of bees are largely within the apiarist's control, namely, its size—that is, the number of bees composing it—and the energy of its worker bees. The energy of these bees will depend on the choice of their mother, the queen bee, and on liberal feeding when in the young larval stage of their lives, whilst the number of workers in the colony is greatly influenced by the number of worker or small cells provided.

The choice of a queen, and the energy of her worker bees, which is very much influenced by the male bee the virgin queen mates with, is a subject apart from profitable brood combs. It will be better for a beginner to thoroughly understand how to produce good comb before choosing his queen.

The first thing essential to a colony is a properly furnished brood chamber; in this a valuable queen can prove her worth.

Many beginners in New South Wales seem surprised that, even in a good honey flow, their colonies have produced only a small surplus, in spite of the fact that the queens in charge of these colonies have cost from 15s. to £1 5s. each. When such a case is investigated, the cause of the trouble is nearly always found to be a set of badly-built combs in the brood chamber, with an extremely low percentage of worker cells. Indeed, in some instances, a thorough examination of the brood nest is impossible. Starters of comb foundation have been used and insecurely fastened, with the result that, after a few weeks of spring honey flow, the brood chamber is more difficult to examine than a mass of brood comb in a boxhive. A bees' nest in the bush or a box hive of bees affords an example of naturally built comb, free from any of the devices surrounding combs in a modern beehive. To examine quickly so few as eight moderately-sized slabs of comb from such a brood nest is a thing that only an expert can do in comfort without killing bees or starting robbing.

During the very earliest apiary experiments, the need was felt for a comb which could be removed from a cluster of bees, be examined and returned, without disturbing any of its neighbours. The outcome of experiments this necessity suggested was the hanging bar frame—the same in principle, if not in detail, as the frame in use at the present day. The history of the development of this frame, giving an account of the many modifications it went through from the time it was first in use, is found in bee periodicals and books on apiculture. The accounts are interesting, but for practical purposes, we are more concerned with the modern article itself than with its evolution.

Brood Frames.

At the present time, the Langstroth brood chamber is the most popular among New South Wales bee-farmers, but the Modified Bolton hive, with its divisible brood chamber, is fast coming into favour. Progressive bee-keepers, in their endeavours to lessen handling and get honey removed from hives and extracted as quickly as possible, are taking advantage of the Bolton methods of handling bees, fully realising that to be able to examine combs by the set of eight at once, instead of singly, means more work done in a day with less disturbance among the brood clusters.

Most of what has to be said with regard to obtaining profitable comb will apply to either the Langstroth or Bolton pattern of frame. The former size of frame will be dealt with in greater detail, as comb building in the Bolton hive has previously been described. (See page 506.)

It has been remarked that much of the bee-farmer's success depends on his comb; a beginner will do well never to lose sight of this fact, especially when setting up increase or getting new comb built out for any purpose. A comb, with proper care, can be used for so many seasons' brood rearing or honey storing, that no trouble ought to be spared in getting it well built in the first place. If the wiring and setting of comb foundation is properly done, the apiarist will find the resultant comb one of his best assets.

The Langstroth brood frame as made and sold in Australia is of two patterns, self spacing and plain. Both possess one feature which is of marked importance—the thick top bar, 1 inch wide by $\frac{7}{8}$ inch thick. The top bars of these frames are shouldered, allowing the end bars to fit into a notch which has done much towards producing a strong frame. Old fashioned "thin top" frames have proved too unstable; they are, however, still met with in some of our apiaries. Anyone purchasing hives fitted with "thin top" frames would do well to pass them out as quickly as he can renew them with the more reliable pattern, and to take this into consideration when settling the price of the colonies.

Spacing Combs.

The combs in every bar frame hive require to be "spaced," meaning that they must be so arranged that they will hang parallel to each other, with a certain space between one surface of a comb and the nearest surface of the comb next it, or, what is equivalent, a certain distance between the midrib of one comb and the midrib of the next.

Provided comb has been built centrally within the frame, plain thick top frames can be adjusted to perfection; a practised hand will do this quickly, but anyone unaccustomed to handling bees will not be so successful.

The self-spacing brood frame, often called the Hoffman frame, possesses several advantages which make it a better frame to adopt than the thick top plain pattern frame; but where good comb has been built in plain frames the advantages gained by using the Hoffman are not sufficient to warrant a change.

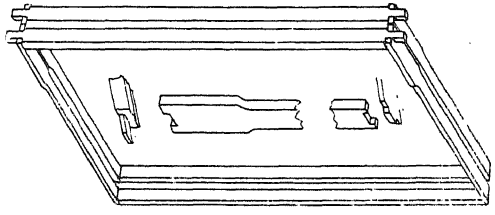


Fig. 1.—Hoffman Self-spacing Frame.

There are devices which can be applied to plain frames, and it pays well to convert a set of good combs in plain frames into self spacers by applying a good form of metal self-spacer, besides giving the frame all the advantages of a Hoffman; it strengthens it.

The main feature of the Hoffman brood frame is its end bars, which are cut $1\frac{3}{8}$ inches wide for a length of from $2\frac{1}{2}$ to 3 inches of their top ends. This extra width allows each end bar to project $\frac{5}{16}$ inch on both sides of the top bar, the projecting pieces being called self spacers. Thus, when a number of straight combs in Hoffman frames are held with their spacers touching each other, a $\frac{3}{8}$ inch space is obtained between each pair of combs—that is, the combs are held with a distance of $1\frac{3}{8}$ inches from midrib to midrib. When adjusting Hoffman frames, the outside comb must be hung parallel to the wall of the hive, then the others can be crowded against it, the spacers of one comb touching the corresponding spacers on the next.

It is frequently necessary to lift three or four combs at once; this is done very simply where the Hoffmann frame is used. The bunch is "grabbed" and the frames pressed together with the finger and thumb, the spaces protecting bees from being crushed.

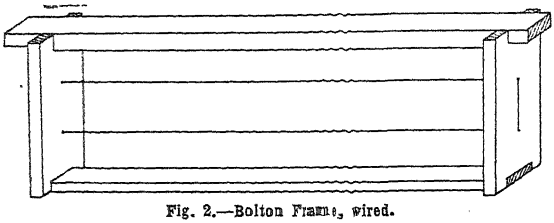


Fig. 2.—Bolton Frame, wired.

The condition of a brood nest or super is often improved by altering the order of its combs; the Hoffman frame lends itself to this operation; for example, it may be necessary to move one of the centre combs to the outside of the set, meaning that this comb must be withdrawn and the four or five combs lying between its position and the wall of the hive must be moved across the space occupied by one frame.

A good apiarist using plain frames will move three or four combs at once by inserting a finger of each hand between each pair of combs; but if occasion should demand that more than four combs in plain frames are to be moved at the one time, it will take at least two moves and comb must be spaced afterwards. The Hoffman frame does away with this. Combs in self spacing frames can be moved across the hive by pressing on both ends of the outer comb.

To pack a hive of bees on comb in plain frames is troublesome, and to render everything secure takes some time, but if the combs have been built in sound Hoffman frames, which have been properly wired, they merely require to be pressed tightly together and wedged; the colony can then be sent a long distance over rough roads without fear of disaster.

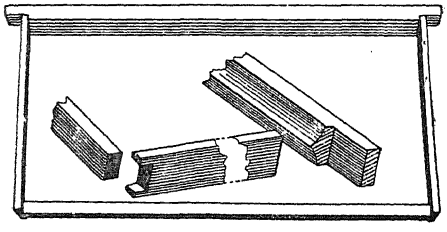


Fig. 3.—Plain thick-top Frame.

Some bee-farmers, more especially those who still use "thin top" brood frames for both brood rearing and extracting, have an objection, or perhaps a prejudice, to self spacing frames, arguing that their wide top bars and the bare $\frac{3}{8}$ inch bee space they allow between the combs are a hindrance to a thorough examination of the brood nest. By using plain "thin top" frames it is claimed that a thorough examination can be made by crowding the frames not under immediate observation, and in turn leaving a wide space for each comb as it is examined. It is asserted that this method enables the apiarist to tell the condition of the brood chamber at a glance, without lifting a comb. It is extremely doubtful if this is the case. One thing, however, is certain, a beginner could never rely on an examination made in such a perfunctory way, especially during the swarming season, whilst even a bee-

farmer of long experience must admit that taking each comb out and examining it separately is more satisfactory.

The examination of the brood chamber is important and certainly worth the trouble of treating each comb separately out of the hive.

In the Modified Bolton Hive the shallow comb is a special provision which allows the apiarist to examine his combs by the set.

Nailing and Wiring Self-spacing Frames.

Hoffman frames are supplied nailed together or in the flat, with either a wedge and groove top bar or a top bar with a moulded comb guide for attaching foundation. One form of top bar will produce as fine a comb as the other. There is an objection to the wedge and groove pattern of top bar where wax moths are a nuisance. The larvæ of the moth burrow into the wood of the wedge and groove top bar and spin their cocoons there; but, with ordinary care and the use of Leather Italian bees, the moth should not be present in the apiary or comb room.

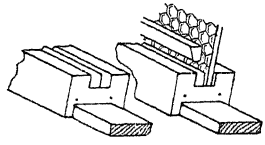


Fig. 4.—Wedge and Groove method of fastening foundation.

If the spacers on Hoffman frames are examined, it will be noticed that on every end bar, one of the spaces is "V" shaped and the other square. Both spacers could be made square, but they would offer too much surface for bees to glue together with propolis. To avoid this and prevent bees getting crushed when the combs are moved, a "V" shaped spacer is intended to press against a square one. When making up Hoffman frames this point must be remembered, and the frames put together so that any comb can be turned with either of its ends towards the entrance of the hive and still have its "V" shaped spacers touching the square ones of its neighbour. To do this, hold an end bar in the left hand with the "V" spacer upwards, fix the top bar by driving two nails through the top part of the end bar into the end of the top bar, turn ends with this much of the frame so that the square spacer is upwards on the right hand, and do the same thing with the other end of the frame. As the frame now stands, the "V" shaped spacer on the left hand end should be facing upwards, and the "V" shaped spacer on the right hand should be turned downwards. Fix the bottom bar into the notches made for it and nail it with two nails at each end. Altogether eight nails are required for a frame. Use 1 inch x 18 fine cement-coated nails.

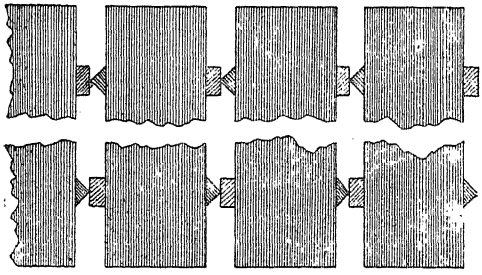


Fig. 5.—Arrangement of self-spacing end bars.

If the method above referred to, or one which has the same result, is not adhered to when nailing frames, two sets of "V" shaped spacers will often be found touching each other. When this is the case, a little pressure will cause the spacers to slip past each other and allow combs to come too close together.

After choosing a good pattern of brood-frame, it remains for the apiarist to determine what method he will employ to get the frames filled with profitable comb, which will be well enough supported in the frame to stand rough usage such as travelling. When this is accomplished a comb is the result which is of considerable value, will last many years, and is well worth a good deal of trouble to get it as well built as possible.

The best and simplest way to get a strong comb is to wire the frame in which is to be built. This can be done in such a way that the wire passes through the midrib of the comb and is attached to the woodwork of the frame. For thick-top Langstroth size brood frames of any pattern, three or four wires running parallel to the top bar answer best. Both end bars must be drilled with three or four holes, according to the number of wires it is decided to use, before the frame is put together. Piercing end bars by hand is very tedious work. The frames can be ordered ready drilled for three or four wires from the factory at a cost of about 1s. per 100 extra; machine drilled holes are accurately placed along the centre line of the end bars.

For wiring, where four wires are used, start by driving two fine tacks about half way into the outer side of one end bar of a nailed frame, one tack close to each end hole. The wire is threaded first through either of the end holes close to a tack, from the outside, passed across the frame and through the corresponding hole in the other end bar; then on the second end bar through the next hole, across the frame again, and so on, until the end of the wire comes through the last hole, which should be the one close to the second tack, to which it can be fastened at once by twisting and the tack driven home. There are now four slack wires across the frame, which must be tightened by straightening first the one with its end fastened to a tack. This can be done by stretching the wire and holding it against the wood of the frame with the thumb-nail until the next is taut, and so on, until all four wires are tight and the length passing to the reel secured on the last tack. Provided it is not kinked, No. 30 best tinned bee wire will stand all the strain required of it. Some people prefer to cut lengths of wire from the reel, each length sufficient for a frame. This is rather wasteful; more than quite enough has to be allowed so as to strain the wire. A more economical way is to thread the wire by one end, drawing on the reel as it is wanted.

(*To be continued.*)

Milk and Butter Yields at Hawkesbury Agricultural College.

During one Period of Lactation, 1911–12.

H. D. BARLOW, Dairy Instructor.

THE following are the returns of 47 cows, which have completed a period of lactation since the last returns were published.

As three of these cows have been milking for more than twelve months, they have not been included in the order of merit, but, as their returns are above the average, they have been added to the list.

The first three cows produced butter worth £18 9s. 10d., £14 5s., and £13 18s. 4d., respectively, or an average of £15 11s.; and the last three, £7 3s. 4d., £6 14s. 2d., and £5 16s. 8d., respectively, an average of £6 11s. 4d.

It will be noted that, although the first three are a trifle behind the cows which held pride of place last year, the last three have an average of £6 11s. 4d. as against £4 12s. 9d. the previous year.

The average for the whole herd is £11 3s. 6d. as against £10 9s. 4d. for last returns, which may be considered very satisfactory.

The Kerry-Jersey crosses are still well above the average, although they do not show to such advantage as previously, but this is probably due to the fact that most of the cows of this cross are getting aged. Since they have given such excellent returns in this district, it has been decided to purchase some high-class Jersey grade heifers to mate with our Kerry bulls, and, judging by the previous performances of this cross, the result should be very satisfactory.

In comparing the College cows with other herds, it is well to bear in mind that our pastures are of such a character as to make it necessary to hand-feed the cattle practically all through the year, and, although well fed, they cannot be expected to give as good returns as if they were fed on the rich succulent pastures of most of our dairying districts.

All the milking cows are rugged during the coldest winter months, but this trouble and expense has been found to be more than compensated for by the larger supply of milk, and the fact that the cows keep in much better condition.

In the accompanying table, in order to readily estimate the amount of butter, the tables at the back of Mr. M. A. O'Callaghan's book, "Dairying in Australasia," have been used.

TABLE showing Milk and Butter yields during one period of lactation, 1911-1912 :—

Order of Merit.	Breed.	No. of Cow.	Milk.	Average Test.	Butter.	Remarks.
			lb.	%	lb.	
1	Shorthorn Jersey ...	14	9,183	4·1	443	Purchased by Dairy Expert as a heifer, dry.
2	Jersey-Kerry-Jersey ...	56	6,310	4·6	342	Bred at H.A. College.
3	Ayrshire grade	186	7,304	3·9	334	
4	Holstein-Ayrshire ...	47	7,332	3·8	327	
5	Ayrshire grade	193	6,392	4·1	322	
6	Holstein grade	30	7,136	3·7	310	
7	,, ,, ...	11	6,237	4·2	308	
8	Ayrshire	164	6,699	3·9	307	
9	Kerry-Jersey	165	6,528	4·0	307	
10	,, ,, ...	7	5,638	4·6	306	Still milking.
11	Kerry	207	4,706	5·4	300	
12	Kerry-Jersey	19	6,580	3·8	293	
13	Jersey	22	5,167	4·6	280	
14	Holstein grade	308	5,910	4·0	278	
15	Holstein-Ayrshire ...	40	5,459	4·3	276	
16	Jersey-Ayrshire	35	6,014	3·9	275	
17	Ayrshire	310	5,685	4·1	274	Heifer.
18	Ayrshire grade	183	4,364	5·3	273	
19	Red Poll grade	168	6,304	3·7	273	
20	Kerry-Jersey	42	4,969	4·6	269	
21	Holstein-grade	36	5,714	4·0	268	
22	Ayrshire	6	5,703	4·0	268	
23	Holstein-Jersey	15	5,847	3·8	261	
24	Holstein grade	307	5,266	4·2	260	
25	Kerry-Jersey	10	5,674	3·9	260	
26	Ayrshire	13	5,671	3·8	253	
27	,, ...	177	5,237	4·1	252	Still milking.
28	Guernsey grade	309	4,615	4·4	239	
29	,, ,, ...	311	4,660	4·3	236	Heifer.
30	Ayrshire	61	5,056	3·9	231	
31	Ayrshire grade	318	5,478	3·6	231	Heifer.
32	Ayrshire-Shorthorn ...	62	4,500	4·3	228	
33	Ayrshire grade	305	4,159	4·6	225	
34	Kerry	208	3,285	5·4	210	
35	Ayrshire	315	3,996	4·4	207	
36	Guernsey-Ayrshire ...	314	3,962	4·3	200	
37	Kerry-Jersey	75	4,154	4·0	195	
38	Ayrshire	187	4,609	3·6	195	
39	,, ...	325	4,136	4·0	194	Heifer, still milking.
40	,, ...	195	4,006	4·1	193	
41	Holstein grade	18	3,913	3·9	179	Still milking.
42	Ayrshire	317	4,188	3·5	172	
43	Guernsey-Ayrshire ...	43	3,428	4·0	161	
44	Ayrshire	313	2,980	4·0	140	Heifer.
	*Ayrshire grade	25	8,677	4·8	491	Aborted 1st Nov., 1911. Still milking.
	Holstein grade	9	8,442	4·0	307	More than 12 months.
	Ayrshire	94	6,319	4·4	327	,, ,,
			257,592		12,570	

* No. 25 purchased by Mr. O'Callaghan as a heifer in calf.

These results may be briefly summarized as follows :—

No. of Cows.	Milk		Butter.		
	Total Quantity.	Average per Head.	Total Quantity.	Average per Head.	Value at 10d. lb.
47	lb. 257,592	lb. 5,480	lb. 12,570	lb. 267·6	£ s. d. 11 2 11

	£	s.	d.
Value of top cow's butter	18	9	10
,, 2nd ,, ,, ...	14	5	0
,, 3rd ,, ,, ...	13	18	4
Average of the three	£15	11	0
Value of 3rd last cow's butter	7	3	4
,, 2nd ,, ,, ...	6	14	2
,, last cow's butter (a heifer)	5	16	8
Average of the three	£6	11	4

Ramie Culture.

Many inquiries concerning the possibilities of Ramie culture in New South Wales are received by the Department of Agriculture. The following conclusions presented by the Committee on Ramie at the Fibre Congress at Sourabaya, Java, give in a nutshell the very reasons why it does not pay to cultivate it here :—

It is not necessary to make further studies, because,—

1. As far as is known, Ramie cultivation by Europeans has never been profitable.
2. By reason of statements made by experts at the Congress that the elementary fibre of Ramie lacks elasticity necessary for durable woven goods ; and, therefore may be used only for special purposes.
3. At present no machines are known for decorticating Ramie fibre, so as to satisfy economic conditions.

Seeds and Plants for Department of Agriculture, U.S.A.

The Minister of Agriculture is in receipt of a communication from the United States Department of Agriculture, Washington, dated 24th June, 1913, stating that the importation of nursery stock for experimental or scientific purposes by the Department of Agriculture is provided for as follows :—

Section 1 of the Plant Quarantine Act of 20th August, 1912, provides :

"That nursery stock may be imported for experimental or scientific purposes by the Department of Agriculture upon such conditions, and under such regulations as the said Secretary of Agriculture may prescribe."

Under this provision, nursery stock or other plants, seeds or other plant products for propagation not under quarantine, may be forwarded for experimental or scientific purposes by mail, express, freight, or other form of transportation, without permit or other compliance with the requirements of the Act, when such plants are ordered by, or intended for, and are addressed to the United States Department of Agriculture, care of Office of Foreign Seed and Plant Introduction, Bureau of Plant Industry, Washington.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

WHITE ANTS IN FENCING POSTS.—"H.P." : The best mixture for white ants in fencing posts is arsenite of soda, but it is somewhat difficult to get into the posts. If used as a wash, 2 lb. washing soda boiled with 1 lb. arsenic, and then made up to 4 gallons would be a suitable mixture to dip the posts into, or it could be poured into the holes in the posts.—W. W. FROGGATT.

SCALE ON APPLE.—"M.M." : The specimen of apple is attacked with the San José Scale. This should be controlled by spraying with lime-sulphur wash. We recommend an application of this every winter to all deciduous fruit trees.—J. G. R. BRYANT.

CITRUS TREES ON THE CLARENCE.—"G.D." : Citrus stock can be budded at the present time, provided they are well matured, and the bark lifts freely. The following varieties of oranges should do well: Local or Paterson River seedlings, White Siletta, and, if the land is deep, and frosts are not severe, Washington Navel and Thompson's Improved Navel.—J. G. R. BRYANT.

WEED-INFECTED LUCERNE.—"W.T." : It is advisable to cut the lucerne, together with all the rubbish that may be in the field, with a mower, about this time of the year. The first cutting will be done, of course, when the plants are out in flower. It would be well to let the rubbish lie in the field in preference to carting or raking it off; this will act as a mulch to the crop.—H. ROSS.

LIMING.—"C.A." : The lime should be harrowed in very lightly, as the object should be to keep it if possible within the first few inches of top soil.—H. ROSS.

GRUBS IN SOIL.—"J.H.B." : The grubs sent in the soil are the larvæ of some lamellicorn beetle; the only damage they can do to plants is eating off the roots beneath the soil. Stirring up the soil and destroying them is the only way to get rid of them.—W. W. FROGGATT.

MAIZE FOR HAY.—"W.D.M.T." : It is very inadvisable to endeavour to make hay from thickly-sown maize, as the stalks are thick and very coarse and unpalatable when dry. For the purpose indicated it would be far better to sow either Hungarian or Japanese millet.—H. ROSS.

FERROUS SULPHATE AS AN APPLICATION FOR ORCHARDS.—"N.F." : The principal source of information regarding the use of ferrous sulphate as a manure is Griffiths' "Treatise on Manures." More recent writers say very little about it, and its use as an addition to the soil appears to be very small.

Griffiths quotes a number of authorities concerning its value in destroying fungous and other plant diseases arising from the soil, and states that it is "an antiseptic agent capable of destroying the vegetable parasitic diseases which attack farm crops." It is applied at the rate of ½ cwt. per acre, either in powder or dissolved in water.

McAlpine, in his "Diseases of Citrus Fruits in Australia," recommends, among other remedies, sulphate of iron dissolved in water applied to the ground around each tree, 1 or 2 lb. per tree, as a remedy against "wither-tip" of orange and lemon (*Phoma omnivora*), called by most growers "die-back."—F. B. GUTHRIE.

SHOULD LIME-SULPHUR BE APPLIED HOT.—"R.B." : Concentrated lime-sulphur is applied diluted with cold water, which is a considerable saving of time and quite as effective.—J. G. R. BRYANT.

LICE IN CHICKENS.—"D.S.O." : The most effective preventive against lice in setting hens and chickens is the use of strong smelling refuse tobacco in the nests. The bottom of each nest should be covered with the tobacco stems, upon which should be placed soft grass.—D. S. THOMPSON.

PRUNING FRUIT-TREES DURING RAIN.—"F.J.H." : There is no basis for the suggestion that it is not wise to prune trees on a rainy day as the rain will rot the buds. Thousands of trees are pruned in wet weather, and the only trouble that might result would be the inconvenience caused to the pruner.—J. G. R BRYANT.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

Branch.	Honorary Secretary.
Albury	Mr. J. D. Lankester, Albury.
Baan Baa	Mr. P. Gilbert, Baan Baa.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Beckom	Mr. S. Stinson, Beckom.
Bonville	Mr. H. B. Faviell, Bonville.
Borambil	Mr. H. A. D. Crossman, "Homewood," Quirindi.
Bungalong	Mr. E. Hughes, Oakleigh, Cowra Road, *viâ* Cowra.
Cardiff	Mr. F. B. Cherry, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Collie	Mr. C. J. Rowcliff.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coreen-Burraja	Mr. Wm. Stodart, Coreen, *viâ* Corowa.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Deniliquin	Mr. W. J. Adams, jun., Deniliquin.
Derrain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Erudgere	Mr. Frank Hughes, Erudgere.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. W. Smith, Henty.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Jindabyne	Mr. Sylvester Kennedy, Jindabyne
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit, *viâ* Manilla.
Kellyville	Mr. C. F. Boughton, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Portland	Mr. W. C. Gambrill, Lower Portland.
Mangrove Mountain ...	Mr. G. T. Hunt, Mangrove Mountain, *viâ* Gosford.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Moruya	Mr. P. Flynn, Moruya.
Narrandera	Mr. C. F. Pearce, Narrandera.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
New Italy	Mr. F. A. Morandini, New Italy.
Nimbin	Mr. J. H. Hutchinson, Nimbin.
Orangeville	Mr. C. Duck, Orangeville.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkesbourne	Mr. W. H. Weatherstone, Parkesbourne.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose-Kareela	Mr. L. Pieremont, "Vila," Penrose.
Redbank	Mr. J. A. Graham, Woodlands, McAlister, *viâ* Goulburn.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria Streets, St. Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Stockinbingal	Mr. J. Neville, Stockinbingal.
St. John's Park	Mr. A. King, St. John's Park.
Tallawang	Mr. J. E. Hansall, Tallawang.
Taralga	Mr. Dave Mullaney, Stonequarry, Taralga.
Toronto	Mr. J. G. Desreaux, Esmond, Toronto.

Branch.	Honorary Secretary.
Upper Belmore	Mr. J. E. Garred, Upper Belmore.
Uralla	Mr. E. A. Neil, Uralla.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla ...	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen ...	Mr. W. J. Cartwright, Wallendbeen.
Wetherill Park ...	Mr. L. Rainbow, Wetherill Park.
Wolseley Park ...	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Wyong	Mr. Edgar J. Johns, Wyong.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Demonstrations in Clearing Land and Subsoiling with Explosives.

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. H. C. Coggins, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Bee-keeping.

A series of lectures on bee-keeping is being arranged by Mr. R. G. Warry, Instructor in Apiculture. Secretaries, whose branches intend availing themselves of this opportunity to receive a practical insight into this branch of agriculture, are requested to make early application.

Veterinary Lectures.

In connection with the lectures to branches of the Agricultural Bureau, it is herewith pointed out for the information of honorary secretaries that

the following is the list of subjects of lectures which can be delivered to them :—

Horses.—(1). Conformation and Unsoundness (with lantern illustrations); (2) Colic and Treatment of Wounds; (3) Strangles, Influenza, and Tetanus.

Cattle.—(1) Tuberculosis (with lantern illustrations); (2) Contagious Abortion and Contagious Mammitis; (3) Ticks, Tick Fever, Tick Infestation and Eradication.

Sheep.—Parasitic Diseases of Sheep.

Pigs.—Diseases of Pigs.

General.—(1) Parturition of Farm Animals (with lantern illustrations); (2) Feeding of Farm Animals and Dietetic Diseases; (3) Sterility, Causes and Treatment in all classes of Stock.

REPORTS AND NOTICES FROM BRANCHES.

Baan Baa.

Mr. A. H. E. McDonald, Manager of the Coonamble Experiment Farm, delivered a lecture on wheat-growing to members of the Baan Baa branch on the 19th July.

Rank Growth on Fallowed Land.

Regarding fallowing, Mr. McDonald remarked that it was frequently contended by wheat-growers in the North-west that it caused excessive growth, which resulted in the lodging of the crops. This was likely to take place where weak-stemmed varieties were sown, and when the sowing was made early, and feeding-off was not practised. If farmers adopted the same system of sowing for fallowed land as they practised on land which they did not fallow, they were bound to have trouble. The land generally in the North-west was very fertile, and when charged with moisture by fallowing was likely to cause lodging if the wheat was not sown with judgment and treated properly afterwards. Frequently, also, it was difficult to obtain sheep to feed off the crop, as those men who had sheep usually had plenty of grass for them in their own paddocks at the very time when farmers were looking round for stock. The farmer who fallowed should endeavour as far as possible to get a nice, strong growth in his crops without recourse to feeding-off. This he could do by selecting good, strong-stemmed varieties, and by timing his sowing with judgment. If crops were sown in April on fallowed land the growth was bound to be excessive, but by delaying planting until May the risk could be very largely avoided. There was very little advantage in sowing wheat in the ground in April, and there were many risks. Instead of sowing early, a farmer would be doing better if he were preparing his land for sowing, and had it ready to start this work during May. By so timing the sowing, all risk of lodging and also of frosting, was avoided.

In the North-west, either early or late varieties gave the best results. Mid-season varieties were not the best as a rule. On the whole the late varieties were better than the early sorts. September, as a rule, was a dry month, and some of the hardy, early varieties did not feel this dry spell so very much, as they matured their grain on the winter rainfall. There was, however, serious risk of frosting attached to these varieties. The late varieties, such as Marshall's No. 3, Rymer, and Yandilla King, gave excellent results in the North-west, as they did not head-out until the end of September, and they were thus not materially affected by the dry weather of that month. October was usually a good month for rain, and these late varieties derived great benefit therefrom. They hung on through dry periods until the late rains came, and then gave good yields, while earlier varieties perhaps failed. At Gunnedah, in 1912, one farmer got 27 bushels per acre from a block of Rymer, because it lasted through until rains came in the middle of October. Earlier varieties near the same block gave very low yields.

Unfortunately, many farmers this season in the districts referred to, sowed their wheat too early, and they made the further mistake of sowing early-maturing varieties very early. The result was that many of the crops were very forward. Some of them were even then coming into ear. A question which was agitating the minds of the owners of these crops was what they were going to do with them. It was hardly likely that they would escape frosting, and the only means of turning them to profit seemed to be to make hay of them. In a few weeks fairly good drying weather might be expected.

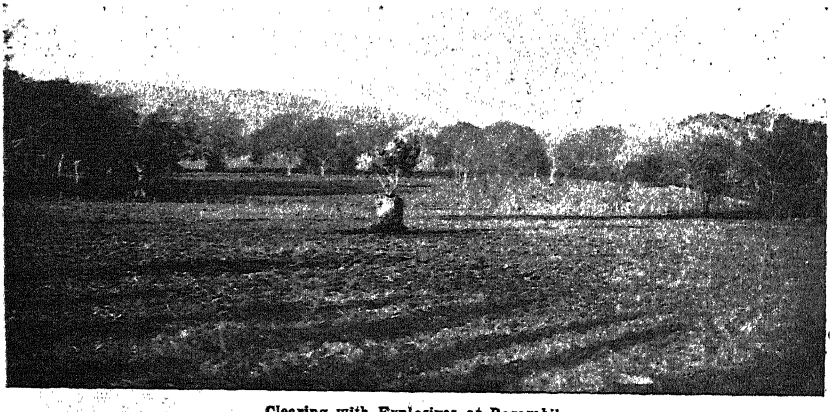
The crops should then be very carefully examined, and if found to be frosted they should be cut. In the Sydney markets there was always a ready sale for good chaff, notwithstanding that, as a rule, chaff from the North-west brought a poor price in the Sydney markets. Some growers had the idea that this was due to prejudice on the part of buyers. Such was not the case, however. It was altogether due to farmers sending in poor produce. Sydney buyers liked a good, green sample, with a sweet smell, well cut, and put up in nice bags. The north-western chaff generally looked as though it were made from straw, and cut up with an axe. The crop should be cut when the stems were still green, and when the grain was in an embryo state. It should be properly dried and cured, and should be cut by a chaffcutter, with the blades sharp and well set, and a steaming apparatus attached. The steaming was very important, as it enabled a good, clean cut to be made, and this increased the value by from 10s. to 15s. per ton. In fact, the increased value would pay the cost of chaffing.

Borambil.

A successful demonstration of land clearing and subsoiling with explosives was held, under the auspices of the Borambil branch of the Bureau, at Borambil, on the 27th July.

The members and other farmers in and around the district showed their interest in the proceedings by turning out in good numbers.

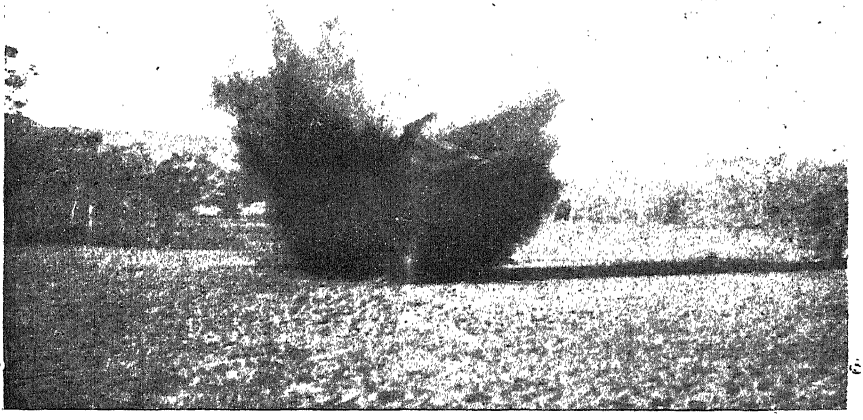
Mr. H. C. Coggins, of the Department of Agriculture, explained the uses of explosives in agriculture, and stated that they were not confined to clearing and subsoiling, but would prove a great labour-saver in regard to excavations for dams and post-holes, the cost of which would be considerably reduced, while as a means of draining land explosives would also prove very valuable.



Clearing with Explosives at Borambil.

THE STUMP.

The clearing demonstration was then proceeded with. A white box stump, about 3 feet in diameter (a pretty tough customer), was the selected victim. Five holes, 2 feet 6 inches deep, were bored underneath the tree at an angle of 45 degrees. One of the holes was bored well into the tap root for the purpose, as Mr. Coggins explained, of cutting this root clean off. The other holes were distributed under the tree in such a manner as to ensure the greatest resistance to the shot. A further hole, 20 inches deep, was bored into the tree about a foot above the earth line. Each hole was then charged with eight plugs of gelignite and a primer, consisting of one plug of gelignite with an electric detonator attached. The wires from these detonators were then connected up between the holes, the remaining two wires being connected to the firing cable, which turn was connected to the "Rackbar" exploder.



Clearing with Explosives at Borambil.
THE EXPLOSION.

After everyone had retired to a safe distance, the handle of the exploder was pushed well down and up went the obstruction in the wheat paddock. On examination after the explosion, it was found that the gelignite had done good work, very little remaining to be done except to fill in the hole.

Mr. Coggins estimated the cost at 4s. 6d. for explosives, while practical men estimated the cost of hand-grubbing the stump at 20s.

The next demonstration was in subsoiling. Mr. Coggins explained the many advantages of the method, and carried out some subsoiling with holes 20 feet apart and 2 feet deep. Each was charged with one plug of gelignite, with ordinary tape fuse and detonator (not electric).

Mr. Coggins explained that no fixed rule could be followed in subsoiling, as the soils in different districts required different treatment. Some soils did not require subsoiling, whereas other soils would produce far better returns by the shattering of the subsoil, which created better drainage, aerated the subsoil, and consequently sweetened it up



Clearing with Explosives at Borambil.
THE RESULT.

and last, but not least, by the shattering of the "hard pan," which is really a "water trap," the existence of which prevents moisture from soaking down, and the roots of crops from feeding on the plant food stored in the subsoil.

Those present evidently appreciated the afternoon's demonstrations and lecture, and several experienced farmers expressed the opinion that explosives were going to be a great feature in scientific agriculture in the future.

Coonabarabran.

The usual monthly meeting of the above branch was held in the Shire Hall on Saturday, the 5th July, with a fair attendance of members.

It was decided that the branch should purchase three bags of seed maize from the Government Experiment Farms, to be retailed to members in quantities as required, viz., one bag each of Early Leaming from Grafton, Early Dent from Glen Innes, and Riley's Favourite from Bathurst.

Messrs. E. J. Roach and R. Croxon were appointed auditors.

The Secretary was directed to write thanking the Department of Agriculture for the demonstration on land clearing and subsoiling with explosives, and requesting the Department to convey to Mr. Coggins a very cordial vote of thanks for his courtesy and very valuable demonstration.

Mr. G. J. Douglas showed some very fine specimens of Early Rose, Magnum Bonum and Satisfaction potatoes, which, considering the poor class of sandy ground in which they were grown, goes a long way to prove what can be done by thorough cultivation. Mr. Douglas also showed some potatoes affected by scab disease, and during his address gave members some very useful information with regard to the treatment of diseased potato-sets with bluestone.

It was decided to admit schoolboys from 12 to 15 years of age as honorary members of the branch.

The meeting closed with a vote of thanks to Mr. Douglas for useful information on potato-growing.

Forest Creek.

A demonstration in clearing land and subsoiling with explosives will be given by Mr. H. C. Coggins to members of the above branch early in September.

Mr. H. S. Major, Assistant Sheep and Wool Expert, will visit Forest Creek on the 14th October for the purpose of giving advice to members during the shearing season. He will stay a week in the district and visit as many sheds as possible in order to classify the various grades of wool.

Grenfell.

Mr. R. G. Warry, Demonstrator in Apiculture, gave a lecture to members of the Grenfell branch.

The Control of Swarming.

In the course of his address while speaking of the special usefulness of each kind of bee to the colony, Mr. Warry said the drone or male bee was shown to be a consumer only, not a contributor to the stores or surplus honey of the hive, his usefulness consisting solely in fertilising virgin queens. The latter being plentiful at swarming times,

drones were reared in large numbers to ensure the fertilisation of each one; but the number of drones a colony would raise, when allowed to, was excessive, so much so, that a very large percentage of drones never met with a virgin queen. Through the use of modern methods and appliances for swarm-control, few virgin queens flew from an apiary; so few in fact that a colony was not economising in the things essential to its success as a good, honey-getting colony, unless restricted artificially in the matter of drone-rearing. The use of full sheets of comb foundation was then briefly explained as the best means of limiting the drone-rearing capacity of the brood chamber.

The use of the worker bee during the first fourteen days of its life after emerging from the cell was emphasised by explaining how young bees, unable to fly far enough to gather stores, were utilised as nurse bees for feeding the developing larvæ in the brood combs, their chyle stomachs, at this time of their lives, being better adapted to the production of chyle or pre-digested food than later, when the honey sac is more developed, and the worker bee becomes a field bee.

The modified Bolton hive was explained in detail, its special adaptation to swarm control and rapid manipulation rendering it the best pattern of hive for a farmer's apiary, where it is specially necessary to plan the apiary work as far ahead as possible.

A question put by one of those present, led to an explanation of "Parthenogenesis" and the parentage of the drone, and opportunity was taken to show that the male progeny of a pure-bred but mismated queen was pure, but the male progeny of one of a mismated queen's daughters was hybrid.

Henty.

Mr. D. H. Schultz read an interesting paper to members of the branch on 12th July on

THE FEEDING OF HORSES.

Mr. Schultz prefaced his remarks by saying that the horse was a grass-eating animal. When young animals were given the privilege of feeding on grass and herbs they grew up much stronger than if fed artificially, such as by hay and chaff. Hay was the next best food for a horse, especially a young one, as he had to chew it well. Under the present faulty conditions of rearing foals, where they were left to pick up beside the mare, much injury was done. The food the foals picked up was too rich and too strong. Fully developed horses could get accustomed to other foods, such as straw, chaff, &c., and live well, but still it went against them. Oats, barley, and wheat, in the order named, were relished and good for horses, but care had to be taken to get them accustomed to them and in varying them. Feeding on damp food and reverting back to dry food was a noticeable instance of this, as it very frequently made horses sick. It was better to let a horse go half hungry than change suddenly also from dry to wet food. He gave incidents of feeding horses on oats and straw, or on husks, and on soaked and boiled wheat, and the effect it had. Molasses was a good thing to give with dry feed in a droughty season, and it was particularly useful to give to a mare in foal. It must be remembered that horses had to get used to feed other than their natural, and this they could do. But if they were fed on grasses only when they were young they became stronger, and worked better, and lived longer than if fed on what might be termed artificial foods. Amongst the noticeable things in horse troubles now was that of bad teeth. Years ago this was unknown, but the hard feed given to young animals injured not alone the gums but their teeth, with the result that bad teeth in horses was very common. It was a good plan, also, not to give horses too much food at a time; to fill the manger was a great mistake. It was far better to let a horse eat out its allowance gradually. When a large quantity of food was given, portion of it was left and slummed over, and a horse would not take to it again. He did not believe either in giving horses too much green feed when working, and horses actually preferred harder feed when in work. Regular hours for feeding were very necessary, and it did not do to leave horses long in the stable. If one did so, and the feed was there, horses very often gorged themselves. He found it better to turn the horses into the paddock at night where they could get a bit of picking, or giving them a little hay to nibble at if there was no grass available. He found pollard a good thing to mix with chaff, but the chaff must be wet first and the pollard added afterwards. If the pollard and chaff were wet together, then the pollard became lumpy and injurious to the horses.

Inverell.

The lecture on the breeding and treatment of the Merino sheep given by Mr. J. W. Mathews, Sheep and Wool Expert, before the members of the

Inverell branch, proved, so the Secretary reports, very instructive, though the attendance was not as large as might have been expected.

Mr. Lewin presided, and in referring to the work of the branch, pointed out the advantages which it offered for gaining information.

Breeding and Treatment of Merino Sheep.

Mr. Mathews said the subject was of the greatest national importance. It would be beyond him to estimate to what extent the commercial prosperity of the country was bound up in the immense scope of the merino industry, but it was fitting for him to point out how much more wealth might be added by the better attention which the small farmer might bestow on the breeding and treatment of the Merino. To help them in this direction was the object of his visit.

Local Types.—The greatest success is usually achieved by the man who carefully studied type, and endeavoured to breed the class that would thrive best, not only in the district, but in his own particular locality. Climate plays a most important part in determining the character of the breed. The breeder must consider this, and try and make himself familiar with local ideals. The object of his work was to get local standards recognised and fixed, according to the varying conditions met with. A comparison of the different classes of Merino sheep found in different regions of the State was cited as an example. The Merino of the colder districts is much different in form and conformation, as well as in quality and character of fleece, to the type bred and acclimatised out in a warmer climate. The latter conditions help to develop the frame, while the former has the tendency to diminish it. Out on the plains far west the Merino is big, and the fleece, though coarser, is highly profitable and much sought after. Though the wool of the tablelands brings a high price per pound, the sheep of those districts, because of their smaller bodies and consequent lighter yielding fleece, are less profitable.

History of the Merino.—The Merino originated in Spain. Kept there for many centuries, it was years before it found its way abroad, for the Spaniards most jealously guarded it, and under no pretext whatever allowed sheep to leave Spain. Only by the express permission of the Sovereign power were any obtained by outside countries. Sweden first obtained possession of some sheep so far back as 1723. At a later date both France and Russia sought possession of the breed,—likewise England, and later on America.

The Merino is renowned for its migratory habits, and adapts itself to new surroundings perhaps more readily than any other breed. This, together with the glorious suitability of the Australian climate, has enabled it to render the great service that it has in this country.

The early Merino was originally small in body, and though it excelled for the fineness of its fleece, the yield of wool was very small. Five pounds for a ram and not more than three for a ewe was, on the average, about the weight in early days. Later, with the establishment of the worsted trade, the staple, then not much more than an inch to an inch and a half long, was greatly improved. Formerly Merino wool was used exclusively for the manufacture of "woollen" goods, but by developing the body, and thus adding length of staple, Merino wool became a very valuable acquisition to the worsted trade, and Australian Merino wool is now almost exclusively used for that branch of manufacture. Breeders were advised to favour the Merino type that would enable them to supply this demand, as from this class of sheep, taking both carcase and fleece into account, a better return would be obtainable.

Although all Merinos were originally of Spanish descent, many of the more noted of the Australian flocks derived their origin from other sources. The Australian Merino is a composite breed, made up of types procured from various sources. Whilst pure enough in itself, it has, since leaving Spain, been bred in other countries. Besides the original Spanish varieties, of which there were several, there were the Saxons, Silesians, and in addition to the French variety, the type introduced at a later period from America. At different times all have helped in forming types and in establishing the industry. The Saxons and Silesians were small in frame, beautifully fine in the wool,

but rather delicate. The French (Rambouillets) were much larger in frame, and though somewhat coarser of fleece, possessed a more robust constitution. The American (Vermonts), dense in wool and wrinkly in body, came as an innovation in Merino breeding, but though given every chance they failed "to make good," and are now out of favour.

The Tasmanian Merino, famous for the superfine quality of its fleece, is largely, if not entirely, of Saxon origin. Many others of the older flocks, bred on the tablelands, are also of this descent. Bred for generations for fine wool, they have shown their adaptability to the conditions that favour its production. The Wanganella Merino, renowned everywhere for its great length of fleece, and a class of wool eminently suited to the worsted trade, have, so it is claimed, a clear line of descent from the famous Rambouillet studs. Many flocks are of mixed origin, but those mentioned have a pedigree that gives them purity of type.

The formation of a flock.—Before launching out on a definite line of breeding, every breeder should first make known to himself the type that he is handling, and endeavour, so far as possible, to keep it pure. Only the experienced can afford to experiment. An interchange of blood is sometimes advisable, often necessary, but before introducing an outside strain care should be taken to see that the selection, especially in the case of the sire, will assimilate the qualities desired without disturbing the evenness of the flock. Changes of types from one extreme to the other do not, as a rule, meet with the best results. Uniformity of type is what should be aimed at, and extremes should be avoided. Where a change is necessary it should be worked gradually, and the outcross and succeeding generations judiciously blended.

Points to be considered.—But a point that perhaps should be held still more prominently in view is adaptability and disposition to thrive under natural conditions. This is the basis of all operations with the Merino in Australia. In considering both type and profit, only animals possessing a strong and vigorous constitution should be retained in the flock. Anything delicate should be excluded, and only the strongest bred from. To retain constitution and physical vigour, the breeder should consider conformation and development. The body should be evenly proportioned, and the frame should in no wise be sacrificed to excessive weight of fleece. If the weight of fleece be increased, then the size of body should be correspondingly larger and the frame proportionately greater to carry it. Various specimens of the highest standards of different flocks were shown to illustrate these points. Masculinity in a ram and the feminine characteristics in the ewe should define the physical characters of both sexes. Everything as expressed in a ram should go to indicate strength and masculinity of character. The head should be closely set on, with the horns broad and spreading outwards, a good heavy jaw, and breadth between the eyes, which should be bright; three folds in the neck and not excessive in development. Body wrinkles should be avoided, and the wool should be as even in character and length as possible. Too great a growth of wool around the face and the development of the pocket under the jaw, are not desirable. The latter proves detrimental in seedy country; and the former, in addition to obstructing the view, causes the animals to be nervous and uneasy on being approached, besides giving extra trouble in clipping and wigging. A well-formed animal should have a broad shoulder, low wither, well sprung ribs, rather straight back, broad thigh, broad loin, deep side, and a capacious chest, with good space between the forelegs, denoting lung space. The latter is most essential, as cramped lungs materially affected the vigour and constitution.

A very interesting paper on fruit-growing was read by Mr. A. Lewin at the monthly meeting of the branch, which was held on 18th July. The paper was as follows:—

Fruit-growing.

It is not necessary to dwell on the capabilities of this district, or its suitability for fruit-growing; in fact, it is the only district in New South Wales where cherries and oranges are found growing side by side. The two most important things for those launching out into this industry to look to are soil and situation. Dealing with the former, I would recommend the red volcanic

soil, of which there is a great deal in this district. Observations and experience show that the best orchards are to be found in the localities where this particular soil predominates. I speak of soils purely from a commercial standpoint. I know fruit can be grown on our black and sandy soils, but not in comparison with the red.

I would not recommend anyone to plant in the vicinity of creeks or rivers, on account of the frequency of late frosts. Happily, most of our suitable soils are high up, thereby securing immunity from frosts. The aspect of an orchard is really of no importance, although a northerly or north-easterly aspect is preferable.

As to the kinds of fruits suited to the district, practically every kind of stone fruit can be grown successfully. Peaches, plums, apricots, cherries, nectarines and pears do very well in this district, as well as quinces, but apples on the whole are a failure. This is due to our summers being too hot. All citrus fruits do well—navels, oranges, lemons, and mandarins.

The next question to consider is the distance to plant trees. The most favoured distance is 25 feet each way, although some kinds of citrus fruits should be planted 30 feet each way. Table grapes do exceptionally well in this district. It is advisable to have the rows about 12 feet apart, with 8 feet between the vines, although some growers prefer to plant closer.

Having got the orchard well founded, and approved sorts planted, the next question is the cultivation of the trees. Most orchardists find it an advantage to grow some crop amongst the trees during the time they are coming into bearing. A space about 6 feet square should be kept hoed or dug around all young trees until they are at least three years old. With citrus trees, this should be a permanent work. Most of the ploughing is done in winter, and during the summer months the disc harrow and cultivator can be used to advantage.

As is well known, the chief enemies of the orchardist are the many insect pests and fungoid diseases. The worst to contend with in the insect line is the Queensland fly. Others giving much trouble are the codlin moth, pear and cherry slug, peach aphis, San José, and red scales. Effective remedies have been found for all these pests, excepting the Queensland fly, spraying and fumigating being the chief methods.

Fungoid diseases are also fairly numerous, such as peach curl, anthracnose or black spot on the vines, and pear scab. Most of these can be successfully combated with Bordeaux mixture. Not the least important work in connection with an orchard is the spraying, which, when carefully and judiciously done, is money well spent. The power sprayer is taking its place in all large orchards, enabling the work to be done quickly and well. I have only touched lightly on diseases and their remedies, as it would necessitate writing a book to go into the matter thoroughly.

Another item to mention in connection with fruit-growing is fertilising. It is a mistaken idea to think a tree can go on yielding without feeding. Nitrate should be used sparingly and only in special cases. Phosphates are a decided acquisition to our red soils, and should be sown months before the trees bloom to ensure it being well into the ground to feed the oncoming crop, also to ensure a good setting of the bloom. The drill has proved the most expeditious implement for sowing fertilisers, enabling large areas to be done in quick time.

Mr. LEWIN supplemented his paper with a few verbal remarks relative to pruning, fumigating, and spraying. Pruning, he said, should be done in the right time, the particular method adopted depending largely upon one's own experience. The fumigation of citrus trees was strongly advocated.

Mr. KOOK thought that the subject needed more extensive treatment, and suggested that some of the subjects be treated in more detail by Mr. Lewin at a later date.

Mr. ARKINSTALL asked whether it was wise to cultivate close to citrus trees, on account of the danger of injuring the young rootlets.

Mr. PIGOTT stated he believed in getting as close to the trees as possible, which remark was endorsed by the chairman.

Mr. SOMMERLAD agreed with Mr. Kook that the subject was too wide to be successfully handled in one paper, and suggested that they confine themselves to one aspect of fruit-growing—that of pests and methods of combating them. He thought that the existing legislation regarding the supervision of orchards was too lax, especially in regard to small orchards and fruit gardens. People who made a living out of orchards did not need to be compelled to look after

their trees, as they could not get good crops and good fruit without doing so. But the trouble was with trees in gardens and abandoned orchards, which were frequently full of disease and were not cared for. Such places were the breeding grounds for disease—one such hot-bed would incubate disease enough to infect a whole neighbourhood. A movement to secure more effective legislation to deal with delinquents of this sort might well emanate from the Agricultural Bureau.

Jindabyne.

A branch of the Bureau has been formed at Jindabyne.

The following gentlemen were elected office-bearers for the ensuing year:—Mr. W. Wallace, senr., Chairman; Messrs. L. Le Fevre and Sylvester Kennedy, Joint Hon. Secretaries and Treasurers.

Kellyville.

Mr. H. O. Oliver, M.R.C.V.S., will lecture before members of the Kellyville branch on 6th October.

Lower Portland.

At the usual monthly meeting held on 14th July, Mr. W. C. Gambrill read an interesting paper.

Indian Cane as a Fodder Crop.

Indian cane is a fodder crop that the ordinary farmer cannot very well be without. The crop is not very well known in this district, but I am sure that as soon as its value as a fodder becomes known it will be very extensively grown. It provides an excellent feed for horses, cattle and pigs, the latter thriving on it very well indeed, as the sugar it contains makes it a good fattener for all kinds of stock. It is also very hardy, and will resist a drought to a very great extent, while on the other hand it will not spoil if a flood goes over it. I have only seen the crop at two places, Mr. L. Green's and Mr. B. F. Jones', and at both places it has shown remarkably good results. At the latter place I have had more experience with it, having assisted both in planting and cultivating it.

Indian cane does not seed, and it is necessary, therefore, to plant cuttings in the same way as sugar cane. In the first place, a piece of good land should be selected, and thoroughly cultivated, ploughing as deep as possible, and then rolling and harrowing so as to leave no clods, for the young shoots cannot come up through clods.

The drills should be about 4 feet apart, and the cuttings planted the same distance apart as an ordinary crop of corn in the drills, that is about 3 feet apart. It is best to cover the cuttings by hand, as if covered by the plough they get shifted out of place. To prepare the cuttings the stalk should first be cleaned by taking off all the outside husk or leafy covering, so that the eye at each joint is quite clear, together with a number of small dots all round the joint, from which the roots spring. The stalk is then cut into sections (or cuttings), leaving two eyes on each cutting. This takes a considerable time to do, but as the crop will keep coming for a number of years it is time well spent.

The cuttings should be placed in the drills two together, one straight across the other, forming a cross. By planting this way the eyes form a square about 6 inches each way, and when the shoots come up they form a bunch, a number of shoots coming from each eye or stalk. The cuttings when laid in the drill are placed flat on the ground, not standing up. The drills should be fairly deep—not less than 6 inches.

When the crop is high enough it should be treated much the same as a corn crop, cleaning the rows with the hoe, scuffle and plough. I would not advise using the plough, except for the first working in the early spring, when it is best to work the ground deep. It will not hurt so much to cut the roots then, but later in the season, when the dry weather sets in, the hoe and scuffle will

do all that is required. One feature in favour of Indian cane is that it is a frost-register, and except in places where the frosts are very severe, it will stand all the winter, and keep on growing again the next summer.

Mr. GAMBRILL showed a sample of the cane which was about 7 feet high, and was the second cut of the season. The first cut, which was hardly as high, was taken off by the first week in February.

A general discussion took place, and much interest was shown. During the discussion Mr. L. GREEN supported the paper, and also gave further information regarding the crop as it is grown on the northern rivers. He stated that 22 tons per acre have been harvested.

A vote of thanks was accorded to Mr. Gambrill. At the invitation of the Chairman, Mr. J. Metherell promised to read a paper on "Bee Culture" at the next meeting.

Leech's Gully.

At the usual monthly meeting, which was held on 4th July, Mr. J. Weir, Hon. Secretary, read a very interesting paper.

FALLOWING.

The principal question in connection with this matter is to consider the best time to commence fallowing. In the case of a stubble paddock it was advocated to plough as early as possible after harvest to a depth of from 6 to 8 inches, in order that as much moisture as possible may be absorbed. Mr. Weir laid special emphasis on the necessity for keeping the surface of the land worked up, in order that no hard crust may form, which, he said, would be conducive to the evaporation of soil moisture.

After the land has received the first deep ploughing, it is not advisable to work it again until the seed of any weeds or plants that may be present in the land has had time to germinate and make a slight growth, for if one is continually working his land, this seed does not get a chance to germinate, but is just turned over and over again in the ground until the sowing of the crop is completed, and then it is a case of which will get ahead, the weeds or the crop.

If the ploughed land is left until the seed has made a fair growth, stock should be turned in to eat it off, and as soon as this is done the spring-tooth cultivator should be set to work.

At the conclusion of the reading of the paper, a number of questions were asked, and the general discussion which followed brought out many useful and interesting hints to those present.

Milbrulong.

The annual meeting of this branch was held on the 14th July. The following were elected office-bearers for the coming year:—Mr. J. H. Rogers, Chairman; Messrs. F. Gollasch, E. Hoffman, and J. Gleeson, Vice-Chairmen; Mr. F. W. Gollasch, Treasurer; Mr. O. Ludwig, Secretary.

Moruya.

At the last meeting of this branch, Mr. P. Flynn, Hon. Secretary, read an interesting paper on "Laminitis or Founder in Horses." Some useful hints on the causes, effects, and cure of this disease were given.

Mr. C. J. Sanderson, M.R.C.V.S., Government Veterinary Surgeon, will lecture to members on "Tuberculosis" on the 24th September.

Narrandera.

Mr. M. McKeown, Manager of the Wagga Experiment Farm, delivered a lecture on "Dry Farming" to members of the Narrandera branch. There was a very good attendance, including thirty scholars of the public school, attended by their head teacher.

The action of the head teacher in asking the senior scholars to be present at such a lecture is unquestionably a step in the right direction, and other branches are advised to follow on similar lines to the Narrandera branch.

Parkesbourne.

The monthly meeting of this branch was held on the 16th July. Mr. G. Brown read a very interesting paper on the pruning of young fruit trees.

Sackville.

At the last meeting of members of the Sackville branch, Mr. C. Kaiser, the President, gave an address on "Co-operation with regard to the sale of fruit," several members taking part in the discussion.

Upper Belmore.

A branch of the Bureau has been formed at Upper Belmore. The following were elected office-bearers for the coming year:—Mr. P. Bannon, senr., Chairman; Mr. W. J. Anderson, Vice-Chairman; Mr. M. H. Hodgson and Mr. J. E. Garred, Honorary Secretaries.

Uralla.

A branch of the Bureau was formed at Uralla during August, and the following gentlemen were elected office-bearers:—Chairman, Mr. S. C. Cooper; Vice-Chairamn, Mr. J. H. Yeomans; Hon. Treasurer, Mr. H. K. Buchanan; Hon. Secretary, Mr. E. A. Neil.

The first meeting was held on the 2nd August, when Mr. T. R. Buchanan addressed the meeting on "The Inspection of Orchards, and Orchard Pests." Mr. H. K. Buchanan read an article from the *Fruit World* on "Cherry-growing for profit, and the value of manuring." A general discussion followed, and it was decided to conduct experiments in connection with manuring for cherry trees on light, medium, and heavy soils.

The subjects for discussion at the next meeting are "Fertilisation of Fruit Trees by Bees," and "Cross-fertilisation of Apples."

Walla Walla.

A pruning demonstration, which was attended by a great number of members and others, was given by Mr. J. G. R. Bryant, Assistant Fruit Expert, to the members of the Walla Walla branch.

Wolseley Park.

A pruning demonstration will be given by Mr. J. G. R. Bryant, Assistant Fruit Expert, in Wolseley Park early in September.

Wyong.

Mr. A. E. Massy, M.R.C.V.S., has arranged to lecture to members of the above branch on the 22nd September. "Parturition of Farm Animals" is the subject.

Orchard Notes.

W. J. ALLEN.

SEPTEMBER.

Ploughing.—If the ploughing has not been carried out, it should be proceeded with as soon as possible now that the drying winds of spring may be expected. All weeds, green manures, &c., must be well covered to give them a chance to rot and thus become incorporated with the soil. The soil should be well stirred under the trees, and all weed growth destroyed.

Cultivation.—It is remarkable how the effects of the recent winter rains have almost disappeared. To conserve the moisture cultivation should be practised after every shower, and the ground kept in good heart.

Spraying.—Under any circumstances, as a precautionary measure, it is desirable to spray for fungus diseases, such as peach-leaf curl, black spot or scab of the apple, and shot-hole fungus of the apricot. Lime-sulphur is the best if the leaves have not started, whereas Bordeaux mixture (summer strength) is preferable later. Never spray when leaves or vines are in bloom, as the crop may suffer. They may be sprayed a week before coming into bloom or a week after the fruit has set.

Swabbing Vines.—Grape vines should have all the old rough bark removed from the stems and arms, and swabbed with a solution of either 1 lb. of sulphuric acid to 10 lb. (one gallon) of water, or three quarters of a pint of commercial sulphuric acid and 5 lb. sulphate of iron dissolved in a gallon of water.

Codlin Moth.—The necessary precautions must be taken to minimise the ravages of the codlin moth, and the methods adopted in the past have given such excellent results that a continuance is justified. Four applications of arsenate of lead have been proved to control this pest. The most important spraying is that given just as the majority of the petals have fallen, using 4 lb. of arsenate of lead to 100 gallons of water. The second spraying should follow in a fortnight or three weeks, using only 3 lb. to the same quantity of water. If the moth continues in evidence, subsequent sprayings should be made at intervals of three or four weeks, using the weaker spray. All rough bark and broken limbs should be carefully examined for the pupæ of the moth, and these when found should be destroyed.

It should be noted that Trivett's seedling apple is liable to burning with arsenate of lead, being apparently the most delicate of all varieties. Where possible, "soft" water should be used for dilution purposes, as in some instances the use of "hard" water has increased this tendency to burn.

Planting Citrus Trees.—This may be done this month, and care should be taken to expose the roots to the air as little as possible. Citrus trees may also be pruned, cutting out all dead wood and cross growths, and shaping the trees to give symmetry, as well as convenience in pulling the fruit.

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till -
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (im.)	Wollongbar Farm	*
,, ...	Imperialist ...	Florio	Lady Nancy of Minembah.	,, ,,	*
,, ...	March Pansy ...	Earl March ...	Australian Pansy	Grafton Farm ...	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
,, ...	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	,, ,,	*
,, ...	Elaine's Heir ...	Thessalian II ...	Wagga Elaine	Yanco Farm ...	*
,, ...	Royal Blood ...	Berry Melbourne	Calceolus ...	Wollongbar Farm	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie ...	Berry Farm ...	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Wagga Farm ...	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Kyogle	22 Dec., '13.
,, ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	,, ...	5 Mar., '14.
,, ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Maclean	11 Jan., '14.
,, ...	Prince Souvia ...	Vivid's Prince...	Souvenir(imp.)	Grafton ...	15 Jan., '14.
,, ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Wollongbar Farm	†
,, ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '13.
,, ...	Sunshine ...	King of the Roses	Princess Vivid	Grafton Farm ...	*
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	Claudius (imp.)	Golden Star II..	Claudia's Pride(imp.).	Tweed River ...	18 Feb., '14
,, ...	Trengwainton VillageFavourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
,, ...	Good-bye ...	Western Duke...	Souvenir (imp.)	Wollongbar Farm	†
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Jones Island ...	31 Dec., '13.
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (im.)	Bega	20 Dec., '13
,, ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Kyogle	1 Mar., '14.
,, ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel(imp.).	Murwillumbah ...	10 Nov., '13.
,, ..	Prince of Warren Wood (imp).	Kingsmoor Governor (1952)	Quail (7051)	Macleay River ...	8 Dec., '13.
,, ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Frederickton ...	20 Dec., '13.
,, ...	Rosehill (imp.)..	Northesk (2073)	Faultless Footsteps (6132)	Raymond Terrace	19 Sept., '13.
,, ...	Duke of Orleans	Godolphin Arthur (1664)	Flower of the Preel 3rd (imp.)	H.A. College, Richmond	*
Ayrshire ...	Jamie's Heir ...	Jamie of Oakbank	Miss Prim ..	Wollongbar Farm	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ..	*
,, ...	Orphan Boy ..	Songster of Greystanes.	Rosamond ...	Glen Innes Farm..	*
,, ...	Wyllieland ... Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A.College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin(imp.)	Bratha 4th ...	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

*Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed

Department of Agriculture,
Sydney, 2nd September, 1913.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

JERSEY.—Foxtail : sire, Xmas Fox (imp.); dam, Bellona; calved 24th April, 1912; colour, whole fawn. Price, **20 guineas.**

Bellona was by Optician (imp.) from Pattibelle (192). Pattibelle (192) was by Lily's Boy (imp.) from Claribelle (imp.) Bellona gave 4,362 lb. of milk, testing 5·9 per cent., equal to 304 lb. of butter.

GUERNSEYS.—Belfast : sire, King of the Roses (imp.); dam, Flaxy II; calved 20th September, 1911; colour, lemon and white. Price, **40 guineas.**

Flaxy II is by Rose Prince (imp.) from Flaxy (imp.). Flaxy II's only record is 3,333 lb. of milk, testing 5 per cent. (in 1911), equal to 197 lb. of butter. Flaxy (imp.) in 37 weeks gave 6,443 lb. of milk, producing 334 lb. of butter.

Haymaker : sire, The Peacemaker; dam, Hayes Muzette 7th (imp.); calved 5th January, 1912; colour, lemon and white. Price, **40 guineas.**

The Peacemaker is by Calm Prince from Rose Petersen.

Calm Prince is by Rose Prince (imp.) from Gentle (imp.).

Rose Petersen is by Peter (imp.) from Rose Petal. Rose Petal is by Rose Prince (imp.) from Saucy Sal (imp.).

Hayes Muzette 7th (imp) in 1911 yielded 5,620 lb. of milk, testing 4·6 per cent, equal to 304 lb. of butter.

AT COWRA EXPERIMENT FARM.

JERSEY.—Shakespeare : sire, Sir Pat; dam, Leading Lady; calved 13th January, 1912; colour, whole fawn. Price, **20 guineas.**

Leading Lady is by Berry Melbourne from Lady Tidy 4th.

Lady Tidy 4th was by Golden Lord from Lady Tidy 3rd (imp.).

Berry Melbourne is by Melbourne (imp.) from Rum Omelette (imp.).

Sir Pat is by Sir Jack from Pattibelle (192)

Leading Lady, on her first calf, yielded 3,346 lb. of milk, testing 6 per cent., equal to 237 lb. of butter.

HOLSTEIN COWS FOR SALE.

BERRY EXPERIMENT FARM.

Name.	Date of Birth.	Sire.	Dam.	Price.
				£
Lolkje Field (in calf)	12 Nov., 1904 ...	Garfield	Lolkje	20
Fraulein Arama (in calf) ..	4 Feb., 1907 ...	The Hague ...	Dina's Douwe ...	25
Marigold (in calf) ...	25 Feb., 1907 ...	The Hague ...	Margosa	25

GEORGE VALDER, Acting Under-Secretary.

STALLION PARADES FOR SEPTEMBER AND OCTOBER, 1913.

Date.			Place.	Time.
Monday,	15	September	Liverpool	10·30 a.m.
,,	15	,,	Penrith	11 a.m.
,,	15	,,	Wollongong	2 p.m.
Tuesday,	16	,,	Gundagai	10 a.m.
,,	16	,,	Kiama	10 a.m.
,,	16	,,	Dapto	4 p.m.
Wednesday,	17	,,	Adelong	2 p.m.
,,	17	,,	Nowra	10 a.m.
Thursday,	18	,,	Tumut	2 p.m.
,,	18	,,	Denman	10 a.m.
Friday,	19	,,	Merriwa	Noon.
Monday,	22	,,	Camden	Noon.
,,	22	,,	Wyong	11 a.m.
Tuesday,	23	,,	Milton	10 a.m.
,,	23	,,	Crookwell	11 a.m.
,,	23	,,	Raymond Terrace	2 p.m.
Wednesday,	24	,,	Moruya	10 a.m.
,,	24	,,	Gunning	11 a.m.
,,	24	,,	Lithgow	2·30 p.m.
Thursday,	25	,,	Yass	10 a.m.
Friday,	26	,,	Cobargo	10 a.m.
,,	26	,,	Burrowa	10 a.m.
Saturday,	27	,,	Bega	10 a.m.
Monday,	29	,,	Gosford	11 a.m.
,,	29	,,	Bombala	11 a.m.
Tuesday,	30	,,	Taralga	Noon.
,,	30	,,	Tenterfield	11 a.m.
,,	30	,,	Cooma	11 a.m.
Wednesday,	1	October	Goulburn	10 a.m.
,,	1	,,	Glen Innes	10 a.m.
Thursday,	2	,,	Braidwood	10 a.m.
,,	2	,,	Guyra	10 a.m.
,,	2	,,	Adaminaby	9·30 a.m.
Friday,	3	,,	Queanbeyan	10 a.m.
,,	3	,,	Armidale	9·30 a.m.
,,	3	,,	Uralla	3 p.m.
Saturday,	4	,,	Walcha	2 p.m.
Wednesday,	8	,,	Moss Vale	10 a.m.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1913.

Society.	Secretary.	Date.
Ariah Park P., A., H., and I. Association	J. N. Taylor	Sept. 2, 3
Wellington P., A., and H. Society	A. E. Rotton	,, 2, 3
Grenfell P. and H. Association	G. Cousins	,, 2, 3
Manildra P. and A. Association	C. M. Podmore	,, 3
Germanton P., A., and H. Society	J. S. Stewart	,, 3, 4
Junee A. Association	T. C. Humphreys	,, 3, 4
Young P. and A. Association	T. H. Tester	,, 9, 10, 11
Albury and Border P., A., and H. Society	W. I. Johnson	,, 9, 10, 11
Moama Agricultural and P. Association	A. E. Bartlett	,, 10
Cootamundra A., P., H., and I. Association	T. Williams	,, 16, 17
Cowra P., A., and H. Association	G. S. Fisher	,, 16, 17
Ganmain A. and P. Association	J. F. Ashwood	,, 16, 17
Murrumburrah P., A., and I. Association	J. A. Foley	,, 23, 24
Canowindra P., A., and H. Association	G. Newman	,, 23, 24

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1913.

Society.	Secretary.	Date.
Riverina P. and A. Society (Jerilderie)	J. Kennedy	Sept. 24
Burrowa P. A., and H. Association	W. Burns	,, 25, 26
Hay P. and A. Association	G. S. Camden	,, 30, Oct. 1
Yass P. and A. Association	W. Thomson	Oct. 1, 2
Millthorpe A., H., and P. Association	C. J. E. Hawken	,, 7, 8
Urana P. and A. Society	J. Wise	,, 7, 8
Hillston P. and A. Association	S. J. Gordon	,, 8
Crookwell A., H., and P. Society (Spring Show)	H. P. Levy	,, 10
Balranald P. and A. Society	A. Malcolm	,, 15
Lismore A. and I. Society	T. M. Hewitt	Nov. 5, 6, 7
Tweed River Agricultural Society (Murwillumbah)	A. E. Budd	,, 12, 13
Mullumbimby A. Society	W. A. Davis	,, 19, 20

1914.

Albion Park A., H., and I. Association	M. A. Brown	Jan. 14, 15
Kiama A. Association	G. A. Somerville	,, 23, 24, 26
Wollongong, A., H., and I. Association	W. J. Cochrane	,, 29, 30, 31
Berry Agricultural Association	S. G. Banfield	Feb. 4, 5
Dorrigo A., H., and I. Society	W. R. Colwell	,, 10, 11
Moruya A. and P. Society	H. P. Jeffery	,, 11, 12
Alstonville Agricultural Society	C. D. McIntyre	,, 11, 12
Guyra P., A., and H. Society	P. N. Stevenson	,, 17, 18, 19
Gunning P., H., and I Society	J. R. Turner	,, 18, 19
Dapto A. and H. Society	J. H. Lindsay	,, 24, 25
Inverell P. and A. Association	J. McIlveen	,, 25, 26, 27
Uralla A. Association	H. W. Vincent	Mar. 3, 4, 5
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 3, 4, 5
Tumut A. and P. Association	T. E. Wilkinson	,, 4, 5
Oberon A., H., and P. Association	M. J. Looby	,, 5, 6
Central New England P. & A. Association (Glen Innes)	George A. Priest	,, 10, 11, 12
Coramba District P., A., and H. Society	H. E. Hindmarsh	,, 11, 12
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 11, 12, 13
Gundagai P. and A. Society	A. Elworthy	,, 17, 18
Bangalow A. and I. Society	W. H. Reading	,, 17, 18, 19
Armidale and New England P., A., and H. Assoc'n.	A. McArthur	,, 17, 18, 19, 20
Cobargo A., P., and H. Society	T. Kennelly	,, 18, 19
Camden A., H., and I. Society	C. A. Thompson	,, 18, 19, 20
Goulburn A., P., and H. Society	G. G. Harris	,, 19, 20, 21
Mudgee A., P., H. and I. Association	P. J. Griffin	,, 24, 25, 26
Narrabri P., A., and H. Society	D. J. Bridge	,, 24, 25, 26
Blayney A. and P. Association	H. R. Woolley	,, 25, 26
Macleay A., H., and I. Association	E. Weeks	,, 25, 26, 27
Crookwell A., H., and P. Society	H. P. Levy	,, 26, 27
Luddenham A. and H. Society	F. C. Emery	,, 31, Apr. 1
Cooma P. and H. Association	C. J. Walmsley	April 1, 2
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins	,, 1, 2, 3
Royal Agricultural Society (Sydney)	H. M. Somer	,, 7-15
Bathurst A., H, and P. Association	J. Bain	,, 22, 23, 24
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	,, 22, 23, 24, 25
Tamworth P. and A. Association	J. R. Wood	,, 28, 29, 30
Orange A. and P. Association	W. J. I. Nancarrow	,, 29, 30 May 1
Northern Agricultural Association (Singleton)	E. J. Dann	,, 29, 30, May 1
Clarence P. and A. Society (Grafton)	G. N. Small	May 6, 7, 8
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 7, 8, 9
Lower Clarence A. Society (Maclean)	J. McPherson	,, 12, 13

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Vo . XXIV. PART 10. OCTOBER 2. 1913

Agricultural Gazette of New South Wales.

The Tick Problem in New South Wales.

MAX HENRY, M.R.C.V.S., B.V.Sc.

FOR the last ten years the most vexatious, expensive, and harassing problem which has faced the Stock Department of this State has been the control of the Cattle Tick, and as there still appears to be some misconception of the reasons why this struggle is maintained, it may be as well to go briefly into the whole question, and show why this expenditure and trouble are incurred, and what we look to gain from it.

The Cattle Tick (*Margaropus australis*).

This tick has within recent years been given several names, but it appears to be now definitely settled that it shall be called *Margaropus australis*. The tick which is responsible for the transmission of Texas Fever in America is known as *Margaropus annulatus*, but the differences are so minute that no practical importance can be attached to them.

The natural hosts of the tick are cattle, and it is on these animals that they thrive best. Unfortunately, however, they also attach themselves to horses, sheep, and other animals.

The life history of this tick is given fully in a pamphlet published by the Chief Inspector of Stock, but may be shortly recapitulated here.

The tick's life covers four stages, called metamorphoses: (1) the egg, (2) the larva, (3) the nympha, and (4) the adult or sexually matured form. When the female tick becomes fully matured, she detaches herself from the beast and drops to the ground. On the ground she remains quiet for from two to ten days in summer and two to three weeks in winter, after which she commences to lay eggs. These eggs are extremely resistant to cold, and may survive in places where the adult tick would be destroyed. Under favourable conditions of warmth and moisture, the eggs develop into larval or seed ticks, the time required for which varies from between a fortnight and three weeks to three months or more, taking up their position on the ends of blades of grass, low shrubs, &c., where they wait to fasten themselves on passing cattle. The larval tick having gained its host, attaches itself, and at once commences to draw nourishment from the blood of the animal, and in about a week casts its coat and emerges as an eight-legged nympha. A week later it moults a second time, and emerges as a sexually mature female, who becomes fertilised, and rapidly increases in size till she becomes fully matured, when she is about half an inch long. The male is much smaller, being only about an eighth of an inch long, and he possesses greater activity.

Tick Worry and Tick Fever.

In places such as certain areas of Queensland, South Africa, and the United States, where tick infestation is most severe, the cattle suffer

considerably from what is known as Tick Worry and Tick Irritation. The ill-health resulting must be carefully distinguished from the disease known as Tick Fever, and it is due merely to the mechanical irritation caused by the ticks and to the loss of blood caused by the sucking of hundreds of thousands of ticks. In the worst cases it is impossible to place the tip of the finger on many parts of the body without touching ticks. The affected cattle show inflamed and ulcerous areas where the ticks are found thickest; dependent parts, such as the dewlap, become dropsical; the animals become dull, and have a general unthrifty appearance. Cattle which are bred in tick country, and have been accustomed to severe infestation from their birth onwards, do not suffer to the same extent as those attacked for the first time. In the United States of America this is well recognised, as in their departmental pamphlet on "Texas (Tick) Fever" the following occurs:—

While the power of transmitting Texas Fever is undoubtedly the most dangerous property possessed by the cattle tick, and is the principal cause for adopting stringent measures in securing its complete eradication, nevertheless there still remain other good reasons for the accomplishment of this achievement.

The general aspect of Tick Worry, above referred to, is then described, and the paragraph continues:—

Moreover, if the infestation of ticks is not controlled, the cattle may be so reduced in condition that growth is retarded, and, in the case of young animals, they may never become fully developed, but remain thin, weak, and stunted, and easily succumb to other diseases as a result of lowered vitality. In milch cows, this debilitating influence of the numerous ticks is shown in a greatly reduced milk supply.

Tick Fever.

The actual cause of Tick Fever is a minute parasite known scientifically as *Piroplasma bigeminum*. This parasite is present at some time in the blood of every animal affected with the disease, and the inoculation of blood containing the parasite into a susceptible animal always produces the disease. If looked at through the microscope, it appears as a small rounded or pear-shaped body, usually seen in pairs (hence its name) joined together at their narrow extremities. These parasites are found in the red cells of the blood, which they destroy.

This parasite is taken up by the tick when it sucks blood, and when the eggs laid by such a tick hatch out, the ticks arising from them insert the parasite into the blood of any cattle they may fix themselves to. The parasites develop in the blood of the animal, and an attack of Tick Fever results. The symptoms of the disease become apparent from ten to sixty days after the ticks attach themselves to susceptible cattle. The severity of the attack differs according to the age of the animal, young animals suffering the least. The symptoms consist of those usually seen in high fever: a rise in temperature, quick pulse, rapid breathing, loss of appetite, failure in milk supply, abortion, constipation, and diarrhœa. In very severe cases the urine becomes deeply blood-stained, hence the name of Redwater, which is often given to this disease; but as Redwater does not always occur in Tick Fever, whilst it occurs in many other complaints besides Tick Fever, the name is not a good one to use. In severe cases death may occur in four to seven days, but may be much quicker if the animal exerts itself. Recoveries take

place, but are very slow, and a relapse sometimes occurs. In hot weather, and in bad outbreaks, as many as ninety out of every hundred beasts attacked will die; but in cold weather and where the disease is mild, not more than ten per hundred attacked may die. Death is due to the destruction of the red cells of the blood by the parasite. In countries where Tick Fever has been universal for some years and ticks are prevalent, all the cattle in the country contain the parasite in the blood; but owing to the fact that they have been bred in Tick Fever country, and have been inoculated by ticks from their birth upwards, they are immune to the ill-effects of the disease. Even amongst such cattle, cases of Tick Fever and deaths from time to time occur. When an animal which has died from this disease is opened up, the internal organs are found congested, inflamed, and showing blood spots, and the spleen is greatly enlarged and its pulp broken down into a thick, semi-fluid mass.

Methods Used in Suppressing the Cattle Tick.

In every country where Tick Fever is a serious problem, efforts are being made to eradicate the Cattle Tick, with the exception of Queensland. In the United States of America—according to the report of the Royal Commission, which recently visited that country—the sum of over £100,000 per annum is spent in the endeavour to control the tick, and the Government is asking for more. In South Africa immense sums are being devoted to the work, with the idea of fighting the various ticks infesting that country, especially the one which acts as a transmitting agent for East Coast Fever. In all countries—America, Africa, and Australia—the methods adopted are identical: that is to say, infested cattle are dipped; and it speaks well for Australia that the dipping material which has always been employed is the one which, after many trials, has been officially adopted by the United States Government, and is the one which is almost exclusively used in South Africa. Moreover, the quantities of the various substances used in the dip are almost the same in all countries.

The methods of dipping, spraying, &c., and the building of dips, have been fully dealt with in the pamphlet on Tick Fever by the Chief Inspector of Stock, previously referred to, and need not be gone into here; but it may be pointed out that the results of the visit of the Royal Commission to America bear out in the main principles the methods adopted right through by the New South Wales Stock Department to prevent the spread of tick.

It has been assumed by many stock-owners that one dipping can be relied on to free stock from ticks, but unfortunately it has been found that a few are apt to survive, and consequently the dipping has to be repeated more or less often, according to the result aimed at. If it is only desired to keep the ticks from becoming too numerous, then a single dipping now and then will have a very good effect; but if it is desired to completely clear cattle of ticks before allowing them to pass out of infested country into clean country, then at least two dippings are necessary; whilst if it is desired to clean country of ticks, then the cattle must be dipped repeatedly at rather longer intervals, in order to kill off the progeny of the few ticks which survive the

first dipping, and are later picked up by the cattle, and ticks which may be picked up from the ground for the first time after the first two or three dippings.

After carrying out extensive experimental work, the U.S.A. Department of Agriculture have come to the same conclusion, which is expressed as follows in Bulletin 144, Bureau of Animal Industry:—

From the data obtained in the experimental work, it appears that one treatment with an arsenical dip is insufficient to free cattle from ticks. Subsequent to dipping, ticks continue to reach engorgement and fall from the cattle for several days, and a few nymphs are liable to survive, moult, and possibly continue their development to the engorged stage. On the other hand, no instance has been recorded in which a tick survived and reached fertile maturity after two thorough applications of an arsenical dip given seven to ten days apart; and no larvæ have been observed that have survived a single treatment. The results of the experiments, therefore, show that cattle may be freed from ticks by two treatments with an arsenical dip.

This fully bears out the action of the Stock Department in refusing to allow stock to pass from tick-infested to clean areas without two dippings with an interval of five to ten days. In connection with this matter, it may be pointed out that stock-owners would be well advised to allow nine or ten days to elapse between the two dippings, rather than to try and get them both into five days, or even less.

Experimental work has further shown that any females which survive a dipping lay far fewer eggs than females which have not been dipped, and that very few of these hatch.

With regard to the frequency with which cattle running on country which it is desired to clean up should be dipped, the experience of South Africa furnishes valuable information. South Africa, as is well known, is the home of more tick-borne diseases than any other civilised country, consequently their experience is very wide, and is not confined, as is ours, to dealing with any one tick. This question is dealt with by the Director of Veterinary Research in an article in the *Agricultural Journal* of the Union of South Africa for May, 1911, and may be briefly summarised:—

With regard to the "Blue Tick," which corresponds to our Cattle Tick, it is pointed out that as it requires three to four weeks to complete its life cycle, one dipping every three weeks would be sufficient to eventually clean country of ticks, providing such dipping were continued so long as ticks could live on the ground. This period in South Africa is about eight months, so that it is recommended that dipping should be continued every three weeks for that period.

With regard to other types of ticks known as red, brown, and bont ticks, it is pointed out that as they attach themselves to three different hosts during their life cycle, dipping must be much more frequent, and that it would be necessary to dip every five to seven days for over a year. This, in short, is the practice in many parts of South Africa; and Watkins Pitchford goes so far as to assert, with regard to East Coast Fever, that where the eradication of the tick pest is a serious matter, three-day dipping should be resorted to.

We may consider ourselves fortunate that in New South Wales we have to deal with a tick with a long life cycle spent on a single beast, and not with one of the other type.

The Effects of Dipping on Cattle.

As might be expected, the submersion of cattle and horses in a fluid containing a fair quantity of such a poisonous material as arsenic is not altogether unattended with risk; at the same time, the dangers of such dipping have been greatly magnified by persons interested who desire to evade the regulations. Hundreds and thousands of cattle have been dipped in the regulation dips in New South Wales without showing the slightest trace of injury; and dairy cattle subjected to dipping every three weeks for periods of two or three years can now be seen in as healthy, if not healthier, condition than they were before. In the article by the Chief Inspector of Stock, previously referred to, the fatality amongst stock dipped in properly prepared solution, under good management, is stated to seldom exceed one in 1,000; while, with handling stock, fatality is of still rarer occurrence. The ill-effects generally noticed in connection with dipping are scalding in various degrees and arsenic poisoning. Scalding is mostly seen in travelling stock, which are either dipped when hot and thirsty, or are travelled fast immediately after dipping; and in dairy stock when in low condition, and which return to their holdings immediately after dipping, and travel too rapidly. The parts usually affected are inside and between the thighs, the dewlap, and under the forearms, the skin becoming dry, hard and fissured. In the majority of cases a few days' rest is all that is needed to bring them back to perfect health. The Bureau of Animal Industry, United States of America, in their experiments found that in some cases slight scalding took place, and that such was more severe when crude petroleum was added to the dip than when the arsenic was used without it. The conclusions they come to are as follow :—

Cattle may be safely dipped or sprayed with an arsenical dip containing an equivalent of ·24 per cent arsenic trioxide or less (this is stronger than the New South Wales formula), and the treatment once repeated seven or more days later, though if many treatments are given the intervals between them should not be less than two weeks, the only injury to be expected, as a rule, being, more or less, epidermal exfoliation, and sometimes slight soreness or tenderness of the skin, local in character. It is understood in stating the foregoing conclusions that accidents resulting from a lack of proper precautions to avoid the drinking of the dip by cattle are excluded from consideration; and it should also be noted that cattle are liable to suffer severely after dipping, especially in hot weather, if driven long distances, or if allowed to run short distances so that they become overheated. This latter fact is stated on the basis of observations made by various persons who have had considerable practical experience in the use of arsenic dips. On the whole, however, in view of the hundreds of thousands of cattle of farmers and ranchers which have been treated with arsenic dips, under all sorts of conditions, the number of cases of injury reported has been remarkably small. With regard to arsenical poisoning,

the quantity of arsenic absorbed through the skin is so small as to be absolutely negligible; whilst with cattle the quantity of dip which it would be necessary for them to swallow in order to get a poisonous dose is so large that it would be unlikely that a beast in the ordinary process of dipping could drink it. With horses the risk is somewhat greater. Nearly all the ill-effects associated with dipping can be obviated by correct treatment, *i.e.*, by not dipping animals when they are in a heated condition, or when they have travelled long distances, by resting the cattle after dipping, and by travelling slowly when a move is made, and by not dipping at too short intervals.

Why do we Attempt to Suppress the Tick?

It is not at all infrequently asserted that it would be better for the stock-owner if ticks were allowed to spread and carry Tick Fever right through the eastern half of the State, than that the present restrictions on the movement of stock and the dipping of cattle should be enforced on a small number of stock-owners. Apart from the inherent selfishness of the idea of inflicting a pest such as the tick on farmers not affected, in order to gain some little relief for one's self, it may be as well to consider what the results of allowing the tick to spread would be.

In the first place we should very soon find our cattle beginning to suffer from Tick Worry, a thing unknown in New South Wales, and which it is difficult for men who are not acquainted with the effects of a really severe infestation of ticks to understand.

Then in a very short time we should have Tick Fever amongst our cattle, because it has to be remembered that Tick Fever is now right down on our northern border, and we live in continued fear that the disease will find its way across in spite of all precautions. The mortality which would result amongst our susceptible cattle will be grasped by anyone reading the short notes on Tick Fever on a previous page; and even when a resistant race of cattle grew up, there would still be the constant presence of yet another fatal disease amongst our cattle. Then, as the ticks became numerous, it would be necessary to erect dips throughout the tick-infested country, which would be at least the whole coastal area, and probably a good deal more country as well. It is too often assumed that if the tick was everywhere there would be no need to dip; but this is most erroneous, as the experience of Queensland shows, where on very many farms dipping is part of the ordinary routine work necessary to work the place. If it is not carried out the ticks become so numerous that Tick Worry occurs, the cattle become stunted, and never really fatten, and the members of the Royal Commission which recently proceeded to America emphasised the stunted, poor type of animal found in the tick areas of the Southern States. Then again, it is often assumed that if ticks were right through there would be no need for inspection or restriction of the movement of stock. This, again, is a fallacy, and the experience of Queensland is valuable. It is found that in tick-infested areas, some farmers make every effort to keep ticks down as much as possible, so that their cattle may thrive to the full, and they complain—and rightly—if their neighbours

are negligent and allow ticks to increase; and it may be affirmed without doubt, that if the tick were allowed to spread, it would be necessary to enforce its control just as the control of the rabbit is enforced at present. Then the movements of stock covered with ticks in and out of sale-yards is naturally objected to by stock-owners who wish to keep their cattle clean; movements of infested stock would be restricted for this reason.

Lastly, in a very short time the position on the Victorian border would be that on the Queensland border now, save that New South Wales would be in the present position of Queensland, and Victoria of New South Wales. These are the reasons then which induce us to fight the cattle tick and attempt to suppress it.

Why do we not Inoculate?

The question is often asked why do we not inoculate the cattle first against Tick Fever, and then let the tick spread, as the losses would not be severe.

Inoculation consists in injecting a certain quantity of blood from a diseased beast into a healthy one. As a result, the parasite which causes Tick Fever develops in the blood of the second beast, and gives it a mild attack. After recovering from this the animal is not likely to acquire the disease in a natural way, and is resistant to it. After inoculation cattle should not be travelled for about six weeks, or they may get a fatal attack; they all suffer from fever for a few days, go off in milk supply, &c., and a small percentage die. The majority, however, completely recover in a short time. In a country which is overrun with ticks and Tick Fever it is, of course, the correct method of dealing with it, if it is considered impossible to eradicate ticks; but the authorities in charge of tick work in the United States are entirely opposed to it, holding that it interferes with the work of eradication. New South Wales is not in this position, she has no Tick Fever; if inoculation were started, it would at once introduce the disease with all the loss which that entails, and all the expense and trouble of inoculating the stock, and would perpetuate it. It would mean that all cattle introduced into the infected areas afterwards, and all cattle imported, would have to be inoculated. Then there would be the continuous loss of cattle in which the inoculation did not give immunity, reckoned in the United States at about 7 per cent.

The present Cost, and What it would Cost if the Tick were allowed to spread.

The fight against the tick is costing New South Wales to-day over £20,000 per annum. Would this cost be lowered if ticks and Tick Fever were allowed to spread? The extreme probability is that it would be greatly increased. The expenditure would be occasioned as follows:—

Erection of dips throughout the Coastal Areas, and probably in other parts.

Establishment of salting stations in convenient situations for carrying out inoculation, and manning of same with Veterinary Staff.

Appointment or subsidising of additional Inspectors to control the tick.

Erection, manning, and maintaining of dips and crushes along part of the Victorian border, unless the State were prepared to allow Victoria to bear the whole burden of protecting herself.

To conclude, let us summarise the disabilities caused by the regulations in force in New South Wales and those which would result from the presence of ticks and Tick Fever.

The present disabilities are :—

(1.) The stock-owner cannot move stock freely and at his own will in quarantined areas.

(2.) He cannot send stock out of a quarantined area without inspection and dipping.

(3.) Stock may not be brought into New South Wales from certain parts of Queensland.

(4.) He is put to a certain amount of expense and trouble in having to muster for inspections.

(5.) A very small percentage of cattle are caused certain injury through the enforcement of the quarantine and dipping regulations, although much of this is avoidable.

If Ticks and Tick Fever were widely present in the State, under what Disabilities would the Farmer Suffer?

(1.) A very large number of cattle would die as a result of the first spread of Tick Fever.

(2.) Loss of cattle would continue till immune herds were built up.

(3.) Stock would be continually subject to losses from Tick Worry, and dips now used would still have to be employed.

(4.) The movements of stock to sale-yards, &c., would only be permitted after dipping where infestation was severe.

(5.) One more disease would be added to those for which cattle would be condemned at abattoirs and slaughter-houses.

(6.) Cattle would have to be inoculated, probably at the expense of the owner. The milk supply of inoculated cows would fall off greatly for two to three weeks, and some would die.

(7.) All cattle introduced into the areas would have to be inoculated.

What we hope to Gain.

The one object with which the whole of the work against the cattle tick is aimed is to eradicate that tick from New South Wales, or, failing that, to confine the tick to its present areas, do our utmost to keep it down and to prevent the introduction of Tick Fever into this State. The experience of America holds out some hope to us that we may be able to clean up the country; but we are continually faced by the fact that immediately across

the border we have a seriously infested country, in which practically no concerted attempt is being made to eradicate the tick, although it is admitted that good work is being done in the direction of keeping its numbers under control. Then, again, we have a country in which inoculation has been extensively carried out, consequently the cattle from such country would, if they were introduced into our present tick areas (where we have tick but no Tick Fever) at once introduce the disease and render our ticks pathogenic.

How the Stock-owner can Assist in Eradicating Ticks.

The stock-owner will benefit more than anybody by the complete eradication of the Cattle Tick, for, if that is accomplished, he will be relieved from the present quarantine restrictions, he will be safe from the fear of introducing a deadly disease amongst his stock, and he will be spared the inconvenience of compulsorily mustering and dipping his stock. The stock-owner himself can do a great deal to assist the Department to eradicate this pest: first,—by taking care that his own stock are kept clean, by preventing them wandering on roads or trespassing on reserves, where they would be liable to pick up ticks, by preventing as much as is in his power the movement of stock contrary to the regulations, and by reporting flagrant breaches of the regulations to the officers of the Department; secondly,—by fencing all unfenced country, and by subdividing the properties into easily worked paddocks, he can facilitate the mustering of stock, prevent them wandering, and prevent wandering stock from mixing with and possibly infesting them. Again, in bush or grass country, a good burn in the proper season of the year must do a great deal in the way of destroying young ticks while they are on the grass. The best periods in which this burn could be made are the spring and autumn, so far as the question of tick destruction is concerned. Without the assistance of the stock-owner, it is recognised that it would be far more difficult to eradicate the Cattle Tick; but by the co-operation of the individual with the Department, it is hoped we may make progress towards the eradication of the pest, and meanwhile may keep it in check.

Dairy Science School at Lismore.

The Dairy Science School, which was held at the Lismore Branch Factory of the North Coast Co-operative Company, for the fortnight commencing 18th August, was a distinct success. It was intended for the benefit of factory managers and assistants, cream graders, and butter makers in the Northern Rivers district. Students attended from the following factories:—Casino, Gleniffer, Alstonville, Raleigh, Ballina, Tweed River, Binna Burra, Lismore, South Lismore, Coraki and the Tweed Heads, Murwillumbah, Uki and Byron Bay factories of the North Coast Co-operative Co., and the greater number of those who attended presented themselves for examination at the end of the term. The Dairy Expert reports that the improvement shown was very considerable in the practical work, while in the theoretical knowledge of the subjects treated, a great advance was made.

Trial of Summer Fodder Crops, 1912-13.

Nyngan Demonstration Farm.

H. J. KELLY, Manager.

[Note.—In authorising the publication of this report, the Experiments Supervision Committee desire to draw attention to the low yields obtained, even with proper cultivation given to the crops. As similarly low yields were secured last year, it is evident that farmers in the district must expect unsatisfactory returns from summer fodder crops, and must rely on winter crops. The experiments will therefore be discontinued.—Ed.]

With the object of testing the possibility of successfully growing summer forage crops, such as sorghums, cowpeas, and millets, in the dry Nyngan climate, the following experiment was initiated in 1911 and repeated during the following year:—

The crops were planted in Section C, on the 16th October, 1912.

At the time of planting there was insufficient moisture in the upper 3 inches of the soil to cause germination.

On the 27th October 79 points of rain fell, but as it was followed by very hot weather and drying winds good even germination did not result in any instance, and in most cases only very poor germination resulted.

The weather continued to be extremely dry until February, 1913, and consequently, very poor growth was made.

The Manchurian millet failed to germinate at all, and the Hungarian millet, although a fair percentage germinated, made very little after-growth, and proved a failure for the season.

Good serviceable rains fell in February, which caused the sorghums to make very fair growth, but owing to the rather poor germination in the beginning of the season only light crops were eventually harvested, on 18th April, 1913, although the individual plants made fair growth.

Table giving Details of Planting, and the Yields obtained from the plots harvested:—

Plot.	Crop.	Yield per acre. t. c. q.	Remarks.
1	Sorghum Saccharatum (*Check.*)..	0 17 2	5 feet high.
2	Early Amber Cane	0 19 3	5 feet high.
3	Planter's Friend	2 6 0	About 4 feet high.
4	Sorghum Saccharatum (*Check.*).	1 0 2	About 5 feet high.
5	Boone County Maize	Failure.	Fair germination, poor growth.
6	Hickory King Maize	Failure.	Poor germination, poor growth.
7	Sorghum Saccharatum (*Check.*)..	2 0 0	About 5 feet high.
8	Hungarian Millet	Failure.	Fair germination, very poor growth.
9	Manchurian Millet	Failure.	Failed to germinate.
10	Sorghum Saccharatum (*Check.*)..	1 7 1	About 5 feet high.
11	Kaffir Corn	2 3 0	About 4 feet high.
12	Sorghum Saccharatum (*Check.*)..	1 10 0	About 5 feet high.

Farmers' Experiment Plots.

Maize Experiments, Season 1912–1913.

H. ROSS, Chief Inspector.

Considerable attention has been given of late to the manuring of maize crops, more especially so in districts where it was considered by local farmers that the soil was naturally so well supplied with plant-food, that artificial fertilisers would have little or no effect. The soils on the rich flats near Tumut and the North Coast have usually given such satisfactory results that growers troubled little about manuring, but the results to hand from this year's experiment plots show that in many cases the application of artificial manures gives substantial increases in yield.

The manurial tests conducted were comprehensive in so far that they included fertilisers containing all the essential plant-foods, *i.e.*, phosphoric acid, nitrogen, and potash.

The experiments were uniformly carried out right throughout the State in the following manner :—

I.	1 cwt. superphosphate per acre.	
II.	2 „ „ „	
III.	1 „ „ „	M5.
	½ „ sulphate of ammonia per acre	
IV.	1 „ superphosphate „	P5.
	¼ „ sulphate of potash „	
V.	67 lb. superphosphate per acre	M1.
	50 „ dried blood „	
	33 „ bone-dust „	
	17 „ sulphate of potash per acre ...	
VI.	Unmanured.	

Viewing the results obtained from Tumut, we find that the increased yield due to the application of 1½ cwt. of manure is 17 bushels per acre, whereas 2 cwt. of superphosphate has resulted in an increase of 14 bushels per acre. Correspondingly it will be noticed that both in the North-western district and North Coast manuring, in the majority of instances, has proved profitable. It is not suggested here that farmers should not sow maize without the addition of artificial manure, but it is certainly strongly urged that every farmer should endeavour to carry out experiments in a small way on the lines suggested, in order that he may find out the particular constituent in which his soil may be deficient.

Varieties.

Confirming previous results, the experiments just concluded again point to the fact that the later-maturing varieties, such as Improved Yellow

Dent, and the mid-season varieties like Red Hogan, Early Leaming, &c., are more suitable for long season districts, such as the North Coast, than the early-maturing varieties, Boone County Special, Early Yellow Dent, or Funk's Yellow Dent.

Regarding the suitability of varieties for various districts, the following table may be accepted as a guide to maize-growers :—

RECOMMENDED FOR GRAIN.

District.	Variety.	Period of Maturity.
North Coast	Improved Yellow Dent ..	Late.
	Riley's Favourite	Mid-season.
	Early Leaming	,,
	Red Hogan	,,
South Coast	Boone County Special ...	Early.
	Funk's Yellow Dent ...	,,
	Early Leaming	Mid-season.
	Red Hogan	,,
North-western	Early Yellow Dent	Early.
	Funk's Yellow Dent ...	,,
	Early Leaming	Mid-season.
Southern	Funk's Yellow Dent.. ...	Early.
	Boone County Special ...	,,
	Early Yellow Dent	,,

FOR GREEN FODDER.

Coastal Districts.—Improved Yellow Dent can be strongly recommended.

Inland Districts.—Early Leaming, Riley's Favourite, Improved Yellow Dent, Boone County Special, and Red Hogan are suitable varieties.

New Varieties.

Several improved varieties of maize, *e.g.*, Reid's Yellow Dent, Selected Boone County Special, Ainsworth's 90 Day, and Gold Standard Special, were sown during last season on the South Coast. Owing to the extremely adverse weather conditions prevailing, the crop harvested was a poor one. The harvested seed will, however, be sown in fairly large stud plots this season, and it is anticipated that a quantity of this pure-bred seed will be available for distribution amongst maize farmers next year.

(1) NORTH COAST DISTRICT.

GEORGE MARKS, Inspector of Agriculture.

THE maize experiments carried out during the past season comprised two main series, viz. :—

1. Trial of varieties for grain.
2. Trial of varieties for green fodder.

In addition, fertiliser experiments were conducted with both series.

The names of the experimenters are as follows :—

Messrs. R. Burton-Bradley, Stradbrook, Irvington.
J. F. Lee, Woodview, Casino.
J. Wilson, Coramba (grain trials).
D. W. Baker, Coramba (green fodder trials).
H. B. Faviell, Bonville.
R. Frith, Gladstone.
J. W. Smith, Wauchope.
A. McM. Singleton, Mondrook.
C. J. Rogers, Stuart's Point.

The season was an exceptionally severe one for maize-growers throughout the North Coast, in fact the worst since the farmers' experiment plots have been instituted, and the yields are, consequently, on the light side. It is estimated that the average yields of maize grown in the Clarence district would not exceed 45 bushels per acre, whilst those in the Macleay district would not exceed 50. Some exceptionally heavy returns were obtained from the rich lowlands that have been drained, and which are at their best for cultivation purposes during periods of drought. Though the rainfalls registered during the period of growth on the experiment plots would suggest ample moisture, it must be remembered the value of such rain to the crop depends entirely upon how it is received, and at what stage of growth. In order to illustrate this, one instance might be given. At Wauchope, the plots were planted on the 28th November. The rain recorded during growth was as follows :—

December	...	...	4·62 inches.
January	...	...	1·62 ,,
February	...	...	3·70 ,,
March	...	...	·93 ,,
April	...	...	11·27 ,,
Total	...	...	22·14 ,,

At the critical stage, *i.e.*, when the maize was cobbing, during March, the conditions were very dry, and then, as the maize was ripening off, heavy continuous rains accompanied by gales set in. Somewhat similar conditions were experienced at all the plots. The yields of all the plots were further reduced through the excessive rains of April, May, and June, when from 30 to 35 inches of rain fell. The saturated, and in some instances, flooded condition of the land entirely prevented harvesting operations being carried out, even when the maize was dry enough to pull. Besides, much of the maize was damaged and entirely destroyed by being blown down by the May gales, and otherwise through being subjected to continuous wet conditions. Though the late autumn was very wet, the spring and early summer were very dry. As a result of the excessive dry conditions, the grain and green fodder trial arranged for Mondrook, on the

Manning, and the green fodder trials for Woodview, near Casino, had to be abandoned. The same conditions were responsible for very faulty germination in the green fodder trials at Irvington, and a subsequent heat wave during January completed the work of destruction.

Unfortunately the Yellow Dent variety of seed supplied for the experiments was very badly cracked, evidently due to careless threshing, and though a heavier seeding was made to compensate for the damaged grain, the germination in most of the plots was not as good as desired, and the somewhat low yields of this variety, particularly at Gladstone, is largely attributable to this cause. It must also be noted that heavy hailstorms did much damage. At Gladstone the plots were practically stripped of their leaves prior to cobbing, and a fortnight later, when the plants were beginning to recover, a second storm cut the crop to pieces, and from this it never recovered. The hail likewise consolidated the surface soil, which, owing to the advanced stage of growth, could not be dealt with by the cultivator.

However, notwithstanding the unfavourable growing conditions, the returns are nevertheless interesting, and certain deductions can be drawn from them. In the variety trials early and late varieties are represented. The early varieties are Early Yellow Dent, Funk's Yellow Dent, and Early Leaming. Riley's Favourite is a little later in maturing. Red Hogan and Yellow Dent are very late, and require about the same time to ripen. At all the plots Early Yellow Dent showed signs of blight, the leaves being badly attacked, though the trouble came too late to affect the yield to any great extent. The early varieties were more fortunate than the later ones as regards rainfall. They benefited by thundershowers at cobbing time, and the yields on the whole are much heavier than was anticipated. Of these Early Leaming came out on top. It was also noticeable that this variety gave a comparatively small amount of damaged grain, compared with the others, as a result of the excessive wet after they had matured.

The experiments were carried out on a variety of soils which may be briefly described as follows :—

Irvington—Very heavy, black, retentive soil.
Woodview—Lighter soil than at Irvington, and situated on hillside.
Coramba—Dark brown, alluvial formation, friable nature.
Bonville—Chocolate loam of volcanic formation.
Gladstone—Sandy alluvial formation; a very old maize farm.
Wauchope—Light brown alluvial.
Stuart's Point—Light red loam, volcanic formation.

With the exceptions already referred to, the soil at all the places was well prepared, and the seed planted under favourable conditions. Thorough and systematic cultivation was carried out during the early stages of growth, and the plots generally were well cared for. It was with difficulty that the maize was saved from being destroyed at several of the plots when the districts were flooded.

Variety Trial—Green Fodder.

The green fodder trials were carried out at Coramba, Bonville, Stuart's Point, and Gladstone. They represented varieties considered suitable for producing large quantities of green material for stock feeding, either in its green state or preserved as ensilage. In addition, Planter's Friend was grown, and at Coramba and Gladstone splendid returns were obtained. Being much later than maize in maturing, it was more fortunate in receiving the benefits of rain. A glance over the tabulated return shows Yellow Dent as giving heavier returns than any of the others in three out of the four plots, whilst at Gladstone Red Hogan and the local variety gave heavier returns. In justice to Yellow Dent, it must be noted that the seeding at Gladstone was not quite as heavy as was wished (due to inferior seed as before stated), and that fact must be considered when comparing the results. At Bonville, Mr. Faviell saved some seed of the variety Marlborough Prolific that was grown the previous year in the plots, and though some of it was not quite pure a plot was planted. It is a variety admirably suitable for green feed, giving a large quantity of leafy growth with comparatively slender stems. It gave the heaviest yields at Bonville. In passing, it should be stated that maize is not valued on the coast as it should be as a fodder, particularly for dairy stock, and even under drought conditions, when pastures are bare, there are several varieties of maize which, with intelligent cultivation, will yield wonderfully well. The yields are computed from the weights obtained from a portion of a drill 1 chain long representing fair average growth. For these trials the maize was sown at the rate of about 20 lb. to the acre, in drills 3 feet apart.

Planter's Friend being later in maturing than the late varieties of maize, benefited from the April rains, and this, combined with its ability to better withstand the effects of drought, was responsible for the somewhat heavy yields, particularly at Coramba. Signs of rust were apparent at several places, but there was not sufficient to seriously interfere with the growth.

Plots of cowpeas were planted, but though they did well, the heavy rains in the late autumn caused most of the leaves to fall off, and the weed growth that followed did not permit of comparable weights being obtained. At Gladstone the plants were in full growth when weights were taken.

Fertiliser Trials.

The variety selected for this series was Yellow Dent. The various mixtures of fertilisers were the same as used in the grain experiments. On the whole, the yields were not affected to the same extent by the dry weather as the grain trials, but, nevertheless, they are far below the general average for the North Coast. In every instance except one, the plot planted without fertiliser gave the lowest yield of all.

Two plots were planted using superphosphate at the rate of 2 cwt. and 1 cwt. respectively, but the yields obtained show marked differences to those of the grain trials, where the yields were practically the same. On perusing the tables,

it will be noticed that the averages of all the plots show that the unmanured plot yield 12 tons per acre, whilst two of the plots, with M1 and M5 manures, give over 4 tons per acre increase, representing over 33 per cent. It is certain that the plots did not get the full benefit of the fertilisers through the dry weather at their usually fast-growing period, which fact makes the yields the more interesting. Using fertilisers for maize for green fodder is practically unknown on the North Coast; at all events not a single instance has come under my notice where artificial fertilisers are systematically used for this purpose. The results certainly speak for themselves, but further tests are required before deciding definitely which mixture or single fertiliser is the most profitable to use. It is only necessary to draw the attention of dairymen to the value of an extra 4 tons per acre of green fodder during a period of drought, which the experiments show can be obtained by an expenditure of 5s. or 6s. per acre. At Gladstone, Stuart's Point, and Bonville the plots manured with M5 showed out by their better growth of a bright dark green colour throughout the whole season of growth. The differences (where noticeable) in the other manured plots were not so conspicuous.

Variety Trial—Grain.

These tests were carried out at six centres. The early varieties fared better with weather conditions than the late varieties Yellow Dent and Red Hogan, and this fact should be borne in mind when comparing the results. As before stated, the heavy rains came too late to be beneficial, though the rainfall figures might have suggested the reverse. The averages place Early Leaming on top, and in every plot but one this well-known variety maintained its reputation. It was also noticed with this variety that there was a smaller percentage of inferior or damaged grain than with any of the others. This is in no small measure due to the cobs being well covered with husk, and the habit of the cobs to hang down when ripe, thus effectively protecting the grain from excessive rains. In view of the heavy rainfall usually experienced in the autumn, this characteristic of Early Leaming is worthy of more consideration than is usually given when selecting a particular variety for the season's sowing. Of the varieties, Early Yellow Dent and Funk's Yellow Dent, both very early-maturing varieties, gave the lightest yields except at Gladstone. Here they were fortunate in benefiting from thunderstorms when tasselling. They, however, do not appear to be so suitable as some of the others for the coast.

At Irvington, Woodview, Coramba, and Gladstone plots were planted of what may be called the farmers' variety, *i.e.*, the variety ordinarily grown by them. At three of the places these plots gave lighter yields than the best unmanured plot, for which the Department provided the seed. These results prove that these growers have been losers, inasmuch as they have not been growing the variety that is best suited to their soil and conditions. In this direction, the farmers' experiment plots are invaluable in giving some idea of the merits of individual varieties, for it must not be taken for granted that a good variety will give equally good results in all districts and

under all conditions. At Gladstone, the local variety grown by Mr. Frith gave considerably heavier returns than any of those supplied by the Department. Mr. Frith pays a good deal of attention to the selection of the seed, but in fairness to the plots, it must be stated that this variety had the advantage of slightly better land, and the germination of the Yellow Dent was interfered with through the grain being badly cracked as already referred to.

Fertiliser Trials.

The variety selected for this series was Yellow Dent. Six plots were planted at six centres; five plots manured, one left unmanured. The fertilisers were used as already described.

During the period of growth the plots manured with M5 at Bonville and Gladstone looked the best. With the other manured plots there were no very striking differences. Unfortunately, some of the cobs from the best plot at Bonville were stolen, evidently for seed, and the true yield cannot be estimated. At Bonville and Gladstone the best manured plots yielded 11 bushels per acre more than the unmanured plots. The averages of the plot place the unmanured at 40 bushels per acre, while M5 gives an increase of 5 bushels. A noticeable feature about this series is that the two superphosphate plots show very little difference—the 1 cwt. per acre giving practically the same as the 2 cwt. In all probability the dry weather is responsible, but in any case further trials are necessary before deciding definitely which is the better quantity to use. Manuring grain crops on the coast with artificial fertilisers is almost an unknown practice. As the result of increases obtained on the farmers' experiment plot in previous years, a few have benefited and now use fertilisers. In view of the adverse weather conditions the results from the fertiliser trials are very interesting, and give further proof that manuring pays. There are many who still labour under the delusion that the agricultural soils of the coast are rich enough without resorting to the use of fertilisers, but they do not consider the enormous quantities of plant food that have been removed by continuous cropping for over half a century, and taken away from the farm in marketing the produce. The best results show that, at Bonville and Gladstone, where an increase of 11 bushels per acre was obtained with the use of fertiliser, it represents at 4s. per bushel a sum of 44s. per acre. The cost of the manure is approximately 6s. or 7s., which leaves a substantial balance in favour of the manure. But even taking the averages as they stand, when an increase of 5 bushels per acre is shown by these experiments, one is naturally inclined to ask—what would be the value of the maize crops of the coast if the annual yields were increased by this amount?

Summary.

A review of the season's operations has revealed several matters of great importance to maize-growers and dairymen, which may be briefly stated as follows:—

1. There are great variations in the yielding qualities of different varieties of maize for both grain and green fodder.

2. The varieties best suited to any particular district can only be accurately determined by actual experiment in that district, conducted over a number of seasons.

3. Early-maturing varieties should be planted so as to receive rains when commencing to tassel.

4. Late-maturing varieties usually catch the monsoonal rains at their cobbing period when planted in November and early December.

5. Many low-lying, rich lands can be utilised for growing maize in dry seasons by thorough drainage and planting early (say, September). The crop requires harvesting immediately it is ripe, so that the autumn rains or possible floods will not destroy it.

6. Many maize-growers are not growing the variety of maize that would give them the heaviest returns on their farms.

7. The yield of both grain and green fodder on coastal lands can be materially increased by the use of fertilisers.

8. On poor soils Planter's Friend will give heavier returns of green feed than maize.

9. A few acres of a strong growing variety, such as Yellow Dent, which usually has thin stems when planted for green feed, will produce large quantities of fodder (even in dry seasons) with proper attention and cultivation. Such fodder can be used green, or conserved as ensilage, or to help the pastures on the farm so that they may be rested and allowed to recuperate after heavy grazing.

10. Sufficient attention is not generally given to the selection of seed for vitality and productiveness when saving one's own seed.

GREEN FODDER Variety Trials. (Maize and Planter's Friend.)

Variety.	D. W. Baker, Coramba.	H. B. Faviell, Bonville.	C. J. Rogers, Stuart's Point.	R. Frith, Gladstone.	Average.
Rainfall in inches ...	12·57	17·47	13·00	14·23	.....
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. qr. lb.	t. c. q. lb.
Yellow Dent ...	9 8 2 8	17 13 2 8	5 11 3 24	15 6 0 9	12 0 0 5
Red Hogan	8 12 3 12	16 2 0 16	4 6 1 20	21 11 2 17	12 13 1 2
Hickory King ...	7 7 1 8	12 11 1 20	3 18 2 8	16 14 3 12	10 3 0 5
Riley's Favourite ...	6 7 2 20	14 2 3 12	4 6 1 20	Too ripe to weigh.	8 5 2 17
Local Variety ...	.....	.....	5 6 0 8	19 15 0 3	... .
Marlborough Prolific	.....	18 9 1 4	.....	....	.....
Planter's Friend ...	26 4 1 24	12 13 1 16	8 6 3 24	21 14 1 12	17 4 3 5
Black Cowpea ...	.....	.....	.....	12 11 0 16	.....

Maize Fertiliser Trials (Green Fodder). Variety: Yellow Dent.

Fertiliser and amount per acre.	D. W. Baker, Coramba.				H. B. Faviell, Bonville.				C. J. Rogers, Stuart's Point.				R. Frith, Gladstone.				Average.			
Rainfall in inches ...	12·57				17·47				13·00				14·23				.....			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
M1, 1½ cwt. ...	12	3	2	8	24	2	0	26	11	19	2	16	17	7	3	21	16	8	1	10
Superphosphate, 2 cwt.	13	15	0	0	20	18	1	16	11	0	0	0	17	13	0	19	15	16	2	15
Superphosphate, 1 cwt.	9	14	1	24	18	0	1	22	9	8	2	8	14	10	1	15	12	18	1	24
No manure	9	8	2	8	17	13	2	8	5	11	3	24	15	6	0	9	12	0	0	5
P5, 1¼ cwt	11	15	2	24	22	8	3	10	9	12	2	0	19	9	3	5	15	16	0	23
M5, 1½ cwt. ...	10	16	0	8	18	3	1	16*	13	5	0	20	23	3	0	5	16	6	3	19

* Germinated rather thinly.

Maize Variety Trials (Grain).

Variety.	R. Burton Bradley, Irvington		J. F. Lee, Woodview.		J. Wilson, Coramba.		H. B. Faviell, Bonville.		R. Frith, Gladstone.		J. W. Smith, Wauchope.		Average.	
Rainfall in inches...	19·51		11·23		16·74		17·47		14·23		22·14		...	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
Yellow Dent	32	44	35	48	53	2	33	42	41	4	43	52	40	4
Early Yellow Dent ...	37	28	35	48	35	32	21	39	44	16	40	40	35	52
Riley's Favourite ...	51	48	31	16	35	20	29	26	57	48	41	20	41	11
Early Leaming... ...	5	0	28	40	48	48	42	23	51	52	50	20	45	21
Red Hogan	42	40	39	0	46	16	35	20	52	44	48	40	44	8
Funk's Yellow Dent ...	39	44	34	32	32	32	25	10	51	24	36	24	36	37
Local variety	29	8	33	48	50	32	.....		70	8	.....		.....	

Maize Fertiliser Trials (Grain). Variety : Yellow Dent.

Fertiliser, and amount applied per acre.	R. Burton Bradley, Irvington.		J. F. Lee, Woodview.		J. Wilson, Coramba.		H. B. Faviell, Bonville.		R. Frith, Gladstone.		J. W. Smith, Wauchope.		Average.	
Rainfall in inches..	19·51		11·23		16·74		17·47		14·23		22·14		...	
	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.	bus.	lb.
M1, 1½ cwt.	33	16	*.....		54	30	35	30	46	44	46	12	43	15
Superphosphate, 2 cwt.	35	24	*26	4	60	6	34	51	48	20	45	40	44	50
,, 1 ,,	36	48	*30	0	60	0	35	25	45	40	45	20	44	37
No manure	32	44	35	48	53	2	33	42	41	4	43	52	40	4
P5, 1¼ cwt.	38	16	37	40	51	12	44	51	46	12	44	28	43	45
M5, 1½ cwt.	35	12	43	40	50	50	44	6	52	20	45	4	45	12

* Not comparable, and not included in averages; considerable quantities destroyed by cockatoos.

(2) SOUTH COAST DISTRICT.

R. N. MAKIN, Inspector of Agriculture.

MAIZE plots were sown at nine different centres on the South Coast during the past season. Of these only those plots that had been given a short fallow returned crops worth harvesting; the summer being a particularly dry one, fallowing had the desired effect.

When to Sow.

Previous experience has proved it unwise to sow maize too early in the spring, owing to the usually dry and windy weather prevailing at that time. The plots were all sown during November, when from 117 to 327 points of rain were recorded at different stations; where the heavier falls occurred the plots made good germination. Prior to this a three months dry spell occurred. The rainfall for December, January, and February was very much below the average throughout—Moruya registered only 131 points for the three months.

Fallowing.

Where possible fallowed land was secured for the plots; the ground was ploughed during the winter months, and cross-ploughed after harrowing before sowing. It is usually a difficult matter to get fallowed blocks, as the farms are small and farmers have not yet fully realised the benefit of fallowing. With further demonstrations there is no doubt that the idea will come into practice generally for spring-sown crops. South Coast farmers must always prepare for the spring months, as weather records prove them to be the driest in the year.

Irrigation.

More use should be made of facilities for irrigation where they offer. There are farms where at a small expense an abundance of water might be obtained by constructing weirs in streams leading away from the ranges. Mr. H. J. Bate, of Tilba Tilba, has arranged a serviceable irrigation scheme by blocking a mountain stream and conveying the water by gravitation to his farm. I noticed during the past season a paddock of maize which he successfully irrigated, whilst other crops in the neighbourhood practically perished. Mr. Reeve, of Tarraganda, Bega, is always assured of a good return from his maize by means of a fine irrigation system.

Manuring.

There were seven plots sown with Yellow Dent maize for a fodder trial, using superphosphate at the rate of 2 cwt. and 1 cwt. per acre. A complete mixture, M1, applied at the rate of 1½ cwt. per acre, and other mixtures, M5 and P5, applied at the rate of 1½ and 1¼ cwt. per acre respectively. The variety of maize used has given the best returns in fodder variety trials in the past, and is now popular on the coast. It will be seen from the returns of fodder that 2 cwt. superphosphate increased the yield by 2 tons per acre

over the unmanured plot, and 12 cwt. per acre better than the best mixture, M1. Owing to the dry weather conditions which prevailed there is no doubt the full effect of the manures was not felt, and it would be unwise to condemn the mixtures. The experiment could well be carried out again.

Grain Trials.

The plots put in for grain all failed to set cobs and were cut for fodder where any growth was made at all, and a return is here submitted. It must be borne in mind, however, that these varieties were sown 1 foot wider apart than in the fodder trial. Of these varieties there was little to choose from a fodder point of view, except that Boone County White made the quickest growth up to the check by the dry weather, particularly at Pambula. It might be noted from the returns in the Boone County manurial trial, where the manures were applied at the same rate as in the Yellow Dent trial, that 2 cwt. superphosphate per acre gave the best returns. In the fodder trial the drills were 3 feet apart, 20 lb. of seed being sown per acre. In the variety grain trials the drills were 4 feet apart, and 7½ lb. seed sown per acre. The grain was sown in every case with the maize planter, and the crops well scuffled until about 3 feet high. In all cases the crops were harvested and made into silage.

MANURIAL TRIAL.—MAIZE FOR FODDER.

Fertiliser and amount applied per acre.	J. Bate, Tilba.	J. H. Martin, Pambula.	Farm Home, Mittagong.	C. T. Stiles, Kanoona.	Average.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Super., 2 cwt. ..	4 13 3 12	8 16 0 0	7 0 0 9	6 9 1 20	6 14 3 10
,, 1 ,, ...	3 7 1 20	8 15 0 0	5 17 0 0	6 17 0 16	6 4 0 16
Unmanured ...	4 16 0 0	4 8 3 12	4 2 1 16	5 8 2 8	4 13 3 23
P5, 1¼ cwt.... ...	3 9 2 24	5 17 1 4	8 4 3 5	6 0 0 0	5 17 3 22
M1, 1½ ,, ...	3 7 1 20	8 3 1 4	5 7 0 13	7 13 1 4	6 2 3 3
M5, 1½ ,, ...	2 17 0 16	9 2 3 12	7 16 2 6	4 12 3 12	6 2 1 9

MANURIAL TRIAL.—BOONE COUNTY GRAIN VARIETY.

Fertiliser and amount applied per acre.	J. H. Martin, Pambula.	Farm Home, Mittagong.	C. T. Stiles, Kanoona, Bega.	Average.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Superphosphate, 2 cwt...	6 17 0 10	6 11 3 10	7 2 3 12	6 17 1 8
,, 1 ,, ...	6 19 1 20	4 12 1 4	5 0 0 0	5 10 2 8
Unmanured	5 9 2 24	4 2 1 16	5 5 2 24	4 19 1 2
P5, 1¼ cwt.	7 1 2 24	6 11 3 10	6 0 0 0	6 11 0 4
M1, 1½ ,, ...	6 14 3 12	6 3 2 11	5 14 1 4	6 4 0 5
M5, 1½ ,, ...	7 6 1 4	7 8 1 8	5 14 1 4	6 16 1 5

VARIETY TRIAL.

Variety.	J. H. Martin, Pambula.	Farm Home, Mittagong.	C. T. Stiles, Bega.	Average,
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Boone County	6 14 3 12	6 3 2 11	5 14 1 4	6 4 0 27
Funk's Yellow Dent ...	5 16 2 8	4 18 3 14	5 14 1 4	5 9 3 18
Early Leaming	5 14 1 4	5 7 0 13	6 14 1 4	5 18 2 7
Riley's Favourite ...	5 7 0 8	7 16 2 6	6 17 0 16	6 13 2 10
Red Hogan	7 0 1 20	9 17 3 1	7 2 3 12	8 0 1 11
Hickory King	.....	5 7 0 13	....	5 7 0 13

(3) TUMUT DISTRICT.

H. C. STENING, Inspector of Agriculture.

THE site selected for the maize experiments at Tumut during the past season was located at the farm of Mr. A. Sturt at Tumut Plains on "plain country," as distinct from the river flats upon which the experiments have been conducted in previous seasons. This class of land was specially chosen to note the effect of the application of fertilisers. The particular block upon which the experiments were conducted was known by the present owner to have been under cultivation for forty years; how much longer he could not say. During this time no attempt whatever had been made to maintain the fertility of the soil, and maize sown the previous season resulted in a failure. The physical condition of the soil plainly indicated depletion of humus, and, to the further detriment of the soil texture, the land had been well tramped by cattle prior to ploughing. As a result, the land ploughed up in large clods, and presented considerable difficulty in the preparation of a suitable seed-bed.

Cultivation.

The land was given a two months' fallow, being ploughed 7 inches deep in August, then rolled and harrowed. Subsequently it was cultivated twice with the spring-tooth cultivator, and ploughed a second time in September 4 inches deep. Prior to drilling it was rolled, and the seed was drilled in on October 14th and 15th with a one-row maize dropper, with fertiliser attachment. The seed was sown at the rate of 10 lb. per acre, in rows 4 feet apart. In the variety trial 1½ cwt. per acre of M1 manure—consisting of superphosphate 4 parts, dried blood 3 parts, bone-dust 2 parts, and sulphate of potash 1 part—was applied. The crops were cultivated three times between the rows with a one-horse Planet Junior cultivator.

The Season.

The season was a most favourable one for maize growing, 16·84 inches of rain falling during the period of growth, distributed as follows:—

RAINFALL TABLE.

Month.	Points.
October	36
November	266
December	318
January	298
February	112
March	617
April	37
Total	1,684

Early in March the crops were levelled by a wind storm, but the yields were not seriously affected thereby. The plots were subjected to a more serious disaster early in the season, in the form of an invasion of caterpillars, which cut down everything before them. A trench was ploughed to cut off their advance, but not before considerable damage was done to the plots of Red Hogan, Hickory King, and Boone County Special (the last named to a less extent). Owing to the destruction wrought by the pest, these plots were considerably thinned, and the yields are therefore not comparable. The maize was ready to harvest by the end of May, but harvesting was delayed until early in July.

VARIETY TRIAL RESULTS.

Variety.	Yields per acre. bus.	lb.
Early Clarence...	52	50
Early Leaming...	49	37
Funk's Yellow Dent	47	26
Early Yellow Dent	44	47
Boone County Special...	38	40
Hickory King	20	11
Red Hogan	17	42

The Early Clarence was sown as the farmers' variety, and was, therefore, from seed produced in the district. Owing to its acclimatisation, it had an advantage over the others introduced from another district. It is a matter of common observation that seed, particularly of maize, introduced into one district from another will not yield its best for the first season, and that the yields will improve year after year until sufficiently acclimatised. Early Clarence is the maize in general cultivation in the Tumut district, and gives satisfactory yields. Owing, however, to the large percentage of core to cob, there is room for improvement, and if a variety such as Early Leaming or Funk's Yellow Dent, with a much smaller percentage of core, were persisted with for two or three seasons until acclimatised, more satisfactory yields would probably result.

Early Yellow Dent was the first to ripen, and by reason of its early ripening should prove the most suitable for late sowing.

Manurial Experiment.

The manure tests have furnished most interesting results, which amply demonstrate the value of applications of fertilisers to maize on this class of land. Since the practice of manuring is practically a "dead letter" in the Tumut district, these results should go far to persuade maize-growers that it would be most profitable to adopt the use of fertilisers. Funk's Yellow Dent was the variety used throughout this test, and although there was no

marked difference noticeable in the growth of the different plots, they yielded as follows:—

MANURE TEST RESULTS.

Manure per acre.	Yield per acre.	Increase per acre due to manure.
	bus. lb.	bus. lb.
No manure	34 6	...
1½ cwt. M1, consisting of { superphosphate, 67⅕ lb.; dried blood, 50⅖ lb.; bone-dust, 33⅗ lb.; sulphate of potash, 16⅘ lb. }	47 26	13 20
2 cwt. superphosphate	48 9	14 3
1 cwt. superphosphate	42 31	8 25
1½ cwt. M5, consisting of { superphosphate, 1 cwt.; sulphate of ammonia, ½ cwt. }	51 21	17 15
1¼ cwt. P5, consisting of { superphosphate, 1 cwt.; sulphate of potash, ¼ cwt. }	43 39	9 33

Owing to the years of continual cultivation without manuring, it might well be expected that the plant food in this soil would be considerably depleted. A study of the above table will show that there was a decided response to the application of fertilisers supplying any or all of the three essential constituents, viz., nitrogen, phosphoric acid, and potash.

It is not surprising that this soil should show such marked results with a nitrogenous fertiliser, owing to its deficiency of humus. It is essential that the store of humus in maize lands should be maintained, not only for the purpose of supplying nitrogen, through the agency of bacteria, but in order to preserve the physical condition of the soil. This may be best accomplished by periodically ploughing in a green crop, such as cowpeas or rape. The river flats, however, would be well supplied with humus, and would therefore probably show no benefit from the application of nitrogenous fertilisers, and there would probably be a sufficiency of potash, but it would be interesting to experiment with superphosphate on these soils. On the "plain country" it has resulted in a monetary return of £2 9s. per acre for an outlay of 10s., and it is also most probable that its application on the river flats would also prove profitable.

(4) SOUTHERN DISTRICT.

H. C. STENING, Inspector of Agriculture.

EXPERIMENTS with Summer Fodder Crops were conducted on Mr. A. J. Rial's property, Wolseley Park, near Tumberumba, during the past season. These were confined to a trial of varieties of maize and sorghum, and a manure test with both crops.

The soil, which was a chocolate loam of basaltic origin, was fallowed for three months prior to sowing, being ploughed 7 inches deep in August.

The seed was drilled on November 18th with a 15-hoe wheat drill, sowing through three tubes only—thus the rows were 35 inches apart. The maize was sown at the rate of 18 lb. per acre, and the sorghum at the rate of 8 lb. per acre. Fertiliser was also drilled in at the same time through all tubes of the drill at the rate of 1 cwt. per acre. The crops were subsequently cultivated between the rows.

Sufficient moisture was available for the crops throughout the season, the rainfall during the period of growth being 16·88 inches ; but the yields were somewhat reduced by the early advent of cold weather, the crops being cut by frost on March 17th and 28th, withering up the leaves, and necessitating the harvesting of the crops before they had reached the best stage. As the leaves of a maize plant represent more than one-third of the total weight of the entire plant, it is fair to conclude that the yields would have been considerably higher had the crops been unaffected by frost. It is also very essential that the maize crop should reach that stage when the grain is "glazed," for not only is the total weight greatest, but at this stage the plant possesses its maximum feeding value. From a feeding point of view, the total weight of the plant is not of so much importance as the total amount of dry matter contained in the plant, for all the rest is merely water. Whereas at the "milk" stage the maize crop contains 20 per cent. of dry matter, at the "glazing" stage it contains 28 per cent. and also the maximum amount of proteids during the plant's growth. It is largely upon the percentage of proteids, otherwise known as "flesh-formers," that the feeding value of the dry matter of any food depends.

The crops were harvested on April 3rd and 4th, and returned the following yields :—

SUMMER FODDER CROPS RESULTS.

Variety.	Yield per acre.	
	tons	cwt.
Maize—Early Leaming	18	0
Riley's Favourite	17	15
Boone County Special	16	4
Red Hogan	15	19
Yellow Dent	15	14
Hickory King	10	8
Sorghum—Early Amber Cane	14	2
Planter's Friend...	11	12
Sorghum Saccharatum	10	18

M1 manure was applied at the rate of 1 cwt. per acre.

Early Leaming, Riley's Favourite, and Boone County Special proved to be excellent fodder maizes, not too coarse in the stalk, and with plenty of leaf. Early Leaming, which gave the highest yield, was the most advanced towards maturity at the time of harvesting, the kernels just beginning to "glaze." Red Hogan and Yellow Dent, being later varieties, require a

longer season. Yellow Dent attained a height of 11 feet; it, however, possesses a rather coarse stalk for fodder purposes. The germination of the Yellow Dent and Hickory King plots was not good.

Early Amber Cane did not return as good a yield as some of the maizes, nor has sorghum as high a feeding value as maize, but farmers would be wise to always grow a crop of Amber Cane supplementary to the maize crop, as it will withstand more adverse conditions than maize, and will, therefore, succeed in a season that is unfavourable to the latter; it will also maintain a continuance of fodder well into winter, for, although cut by frost, it remains succulent, and in this condition is greatly relished by stock. Planter's Friend is later in maturing than Amber Cane, and, therefore, is not so suitable for this district. Although Sorghum Saccharatum was the earliest of the three sorghums tried, it gave the lowest yield, and apparently does not possess any virtues as a green fodder superior to the others.

Manurial Experiment.

A manure test was made with both maize and sorghum, plots being manured with the following fertilisers:—Superphosphate, M1, M5, and P5. A plot was also left unmanured for comparison.

MANURE TEST RESULTS.

Manure.	Yields per Acre.	
	Maize. (Yellow Dent.)	Sorghum. (Early Amber Cane.)
	tons cwt.	tons cwt.
1 cwt. superphosphate	18 13	15 4
1 cwt. M5	17 18	15 16
1 cwt. P5	16 8	15 0
1 cwt. M1	15 14	14 2
No manure	16 6	14 13

An application of 1 cwt. of superphosphate per acre had the effect of increasing the yield of maize fodder 2⅓ tons per acre, and is apparently the most profitable fertiliser.

Mr. Rial had a pit excavated, and wisely converted the whole of the produce of the plots into silage. If this practice were followed by dairymen in the vicinity of Wolseley Park, there should be no reason why dairying could not be continued during the winter months.

(5) NORTH-WESTERN DISTRICT.

A. H. E. McDONALD, Inspector of Agriculture.*

THE season was not a satisfactory one for maize crops. By fallowing, a large amount of moisture was conserved in the land devoted to the experiments, and this produced a good early growth. Later in the season the weather became very hot and dry, especially at the critical time of tasselling. It was

* Now Manager, Coonamble Experiment Farm.

only the provision made by thorough fallowing which enabled the crops to pull through. Had the land not been thoroughly ploughed several months before sowing, well worked with cultivators until the seeding time, and the crop kept well worked during its growth, the yield would have been very low. On the whole they are very satisfactory.

Good germination was secured by opening out light furrows in the fallowed land to expose the moist earth. The corn dropper was then run along these furrows, thus depositing seed and fertiliser in a nice moist seed bed.



Maize Plot on Mr. J. Chick's Farm at Tenterfield, 1912-13.

Fertilisers.

The composition is given elsewhere. Generally it may be said they gave satisfactory results, except at Inverell. There very little difference was noted. This is somewhat difficult to understand, as, during growth, the fertilisers were apparently having a good effect.

At Uralla the mineral fertilisers seemed to be most beneficial, and gave good increases. Superphosphate at the rate of 1 cwt. per acre gave as good yield as double the quantity. The potash in P5 increased the yield over that produced by superphosphate alone. The presence of nitrogen in the fertilisers produced a good growth in the crop, but little increase in the grain yield was obtained. Upon examination of the stalks at harvesting, it appeared as though the stalks had withered away without producing cobs. Perhaps the nitrogen induced a soft growth which suffered under the heat.

At Tenterfield, on the other hand, the presence of nitrogen improved the yield. The mineral fertilisers increased the yields there also. Potash gave more grain than where superphosphate was applied alone.

Varieties.

Early Yellow Dent seems to be the most satisfactory variety for dry seasons. If fallowing is practised a good supply of moisture can be conserved

in the subsoil, and when this is supplemented by a little rain, this variety produces a good yield when other and later varieties suffer. Some of the other varieties, especially Funk's Yellow Dent, do better when rain falls at an opportune time. This was responsible for the better yield of this variety at Inverell. Taking all things into consideration, Early Yellow Dent seems to be the most satisfactory variety for dry districts.

Location of the Plots.

Tenterfield.—The plots at Tenterfield were on Mr. G. Arkinstall's farm. The soil was a light red loam of medium fertility.

Inverell.—The plots were conducted by Mr. J. Chick. The soil was a granite loam, fairly deep, friable, and of medium fertility.

Uralla.—Mr. L. Rixon conducted the experiments. The soil was a light red loam, friable, but rather poor.



Maize Experiments—Funk's Yellow Dent at Uralla.

VARIETY AND FERTILISER TRIALS.—RESULTS.

Variety.	Manure.	Quantity per acre.	G. Arkinstall, Inverell.	J. Chick, Tenterfield.	L. Rixon, Uralla.
			bus. lb.	bus. lb.	bus. lb.
Funk's Yellow Dent ...	M1	1½ cwt.	32 42	22 0	24 9
,, ,, ,, ...	Superphosphate.	1 ,,	33 36	23 4	30 39
,, ,, ,, ...	,,	2 ,,	29 40	23 0	30 0
,, ,, ,, ...	P5	1¼ ,,	29 14	24 19	31 22
,, ,, ,, ...	M5	1½ ,,	30 40	24 0	27 6
,, ,, ,, ...	Nil	Nil	32 10	19 42	24 9
Hickory King	M1	1½ cwt.	24 0	...	...
Early Leaming	M1	1½ ,,	32 42	25 43	...
Early Yellow Dent ...	M1	1½ ,,	20 40	34 19	36 24

Chilian Clover.

J. W. HADFIELD, Instructor in Agriculture, Hawkesbury Agricultural College.

In March, 1907, a sample of Chilian Clover was sent here for trial, together with other seeds, by Mr. F. B. Brown, of Sydney.

It was sown on a small plot of poor sandy soil, and the growth was so satisfactory in comparison with other clovers grown here that the Experimentalist recommended it for further trial. Of a second small sample of seed received, the official record states that "The seed was sown on some of the poorest sandy soil on the 12th of May, 1910. The resulting crop is now (1st December, 1910) 2 feet to 2 feet 6 inches high, whereas all the other varieties have practically failed."

Messrs. Gibbs, Bright and Co. very kindly obtained a parcel of this seed for us, which we received in January, 1912. An acre of land on the River Flats was ploughed and prepared for sowing. No manure was applied, and the seed sown in July, 1912, with a box and barrow seeder, using 9lb. of seed per acre.

The summer was very dry, and a poor crop of hay was harvested about

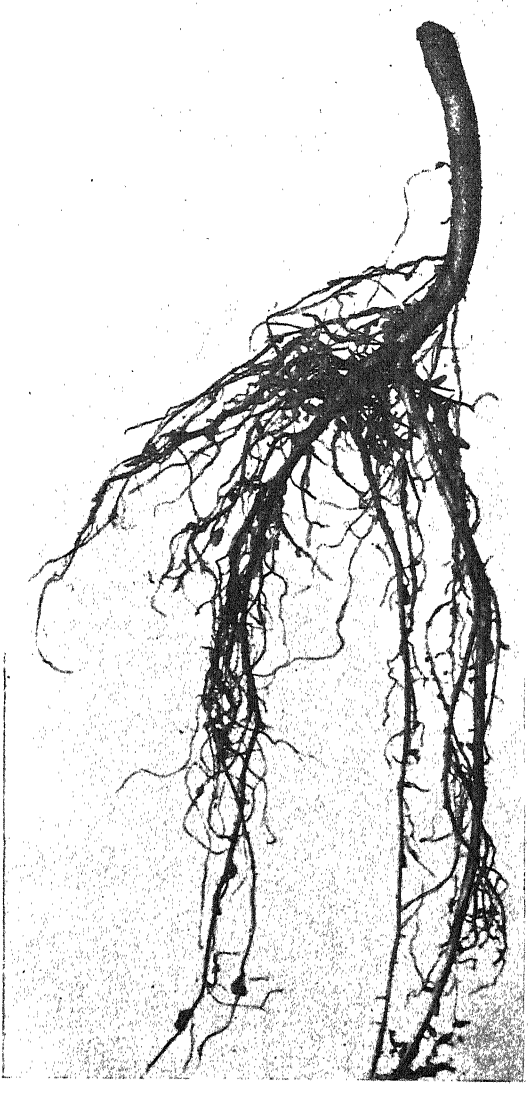


Fig. 1.—Root Growth, showing nodules.

November. Later rains caused an abundant growth, and the following May (1913) a portion was cut and weighed green, when it yielded at the rate of 8 tons of succulent green stuff per acre.

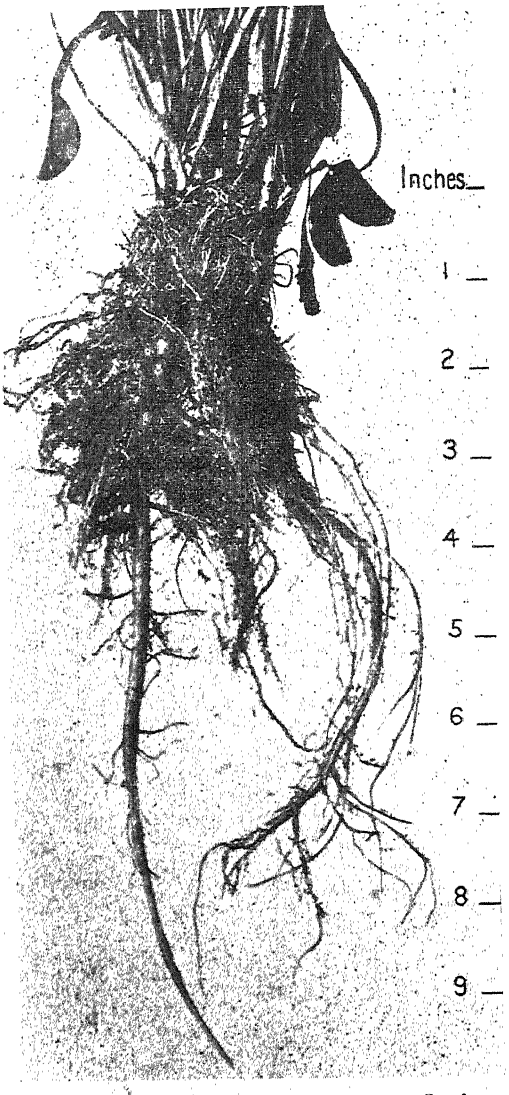


Fig. 2.—Root Growth, showing massed roots near soil surface, with deep, strong roots penetrating.

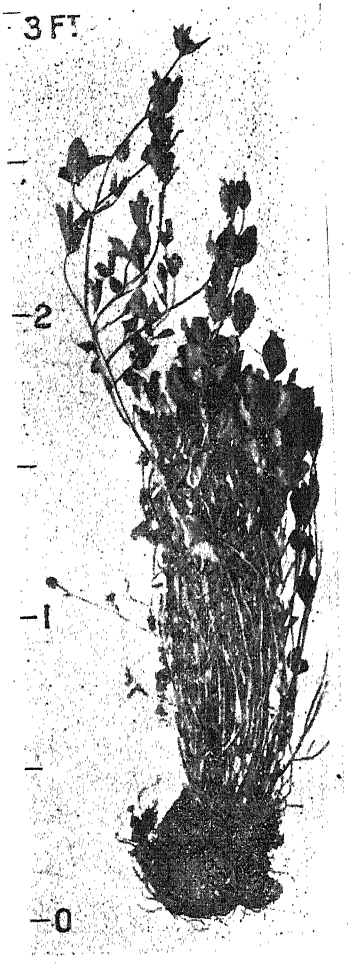


Fig. 3.—Showing extent of Stem Growth.

Mr. Maiden, Director of Botanic Gardens, Sydney, reports:—"The Clover is a strong growing form of *Trifolium pratense perenne*, and is identical with



Fig. 4.—Chilian Clover, showing density of spreading growth.



Fig. 5.—Flower heads of Chilian Clover.

specimens raised from seed received from Sutton & Co. under the name Giant Hybrid Clover."

A question of importance is its seeding properties. It certainly produces seed in small quantities, and sufficient probably to seed itself while it grows, but the question as to whether it will pay to cut and thrash it, or whether it would pay better to import the seed from Chili, has not yet been demonstrated.

The seed imported is not by any means pure, dodder being present in moderate quantities, also one rye grass, one pigeon grass, two composites (species unknown), rib grass, and knot weed.

Germination, as proved by test, was fairly good, showing 92 per cent., while the proportion of dodder was from $\frac{1}{16}$ to $\frac{1}{8}$ per cent.

In regard to getting the seed free from dodder, Mr. Brown says, "I think this would be impossible, as this weed seems to be almost universal throughout Chili."

Dodder seed can, however, be effectively removed from the rest by means of sieves, and no doubt the seedsmen importing Chilian Clover will be able to guarantee it free from dodder.

Destroying Grass and Weeds on Paths.

Experiments as to the efficacy of arsenite of soda for killing grass and weeds on garden paths were recently carried out by Mr. H. C. Coggins, Assistant Inspector of Agriculture. The experiment was arranged to test various strengths, as follows :—

No. 1. 1 lb. arsenite of soda to 2 gallons of water.
„ 2. 1 lb. „ „ 4 „ „
„ 3. 1 lb. „ „ 6 „ „
„ 4. 1 lb. „ „ 10 „ „

The path selected was a gravel one, 100 yards long, the edges of which were covered with couch grass and small weeds. The experiment was carried out in December, the weather being hot and dry.

The final examination showed that Nos. 1 and 2 killed the couch and weeds, but Nos. 3 and 4 only partially killed them, and after the heavy rains they revived, and are now growing vigorously. On Nos. 1 and 2 there was no growth of couch at all, and only a few weeds, the seeds of which were apparently washed there by the recent heavy rains.

If the affected path can be raked prior to spraying, so much the better, as this operation exposes the roots.

The most opportune time to spray is in the heat of summer, and if the work is done towards nightfall the poison has a better chance of soaking in during the night and getting to work on the roots. The spray is very cheap, No. 2 costing 1s. 3d. per 10 gallons.

An ordinary watering-can may be used, but care should be taken to rinse it out with hot water after spraying. Care should also be taken to keep all stock off the treated area for a period of at least four weeks.

Deterioration of Paspalum Pastures.

GEO. MARKS, Inspector of Agriculture, North Coast.

[The following embodies the main conclusions of a report submitted by Mr. Marks in response to a letter from Sir Thomas Ewing *re* the treatment of deteriorating paspalum pastures. This question is also receiving attention at the Wollongbar Experiment Farm, where several experiments are being carried out. Details and results will be published in due course.—ED.]

WITH reference to Sir Thomas Ewing's request that the question of the treatment of paspalum pastures that show signs of deterioration be looked into, I beg to report that I recently visited Burringbar, when the various phases associated with pastures generally were gone into fully.

There is unmistakable evidence that the paspalum pastures are not giving the returns they formerly did, but considering the enormous quantities of vegetation produced annually by this grass; it can scarcely be wondered at, as there must be a limit to its vitality.

In considering means of renovating pastures, it must be remembered that on the North Coast, particularly the north-eastern portion, where there are rich volcanic soils, with abundant rain, it is of little use trying to introduce any other grass. Paspalum in these parts takes complete possession in a very short time. White clover does well in combination with paspalum, and if a little extra attention were given in the direction of encouraging the spreading of this plant by allowing it to seed freely before grazing it short, and also by systematically sowing seed over the paddocks, the feeding values of the pasture would be greatly improved, and in addition there would be good feed available in the late winter and early spring before the paspalum has started its spring growth.

A careful study of paspalum pastures, based upon observation and practical experience covering a number of years, reveals the fact that, where a paddock is stocked heavily without resting, and where the plough is not used, they begin to show signs of deterioration in about seven or eight years after being laid down. At the end of ten or twelve years the decrease in production of vegetative growth becomes apparent to anyone, particularly if the weather conditions be somewhat dry.

The reasons for this deterioration appear to be due to a number of causes, amongst which may be mentioned the following: – Loss of vitality due to the production of enormous quantities of vegetation continuously throughout the year without rest of any kind for a number of years; the development of a large crown at the surface of the soil, which, with age, grows into a thick dense mat, which effectively prevents any young plants from growing underneath; weakness, due to overstocking, which has the effect of allowing the young short shoots to be continually nibbled at, or eaten off, when the pastures are bare, and where there is no spelling or resting by having

holdings well subdivided; prevention of rain from light showers reaching and penetrating the soil by the dense compact mat of crowns; in some instances there may be consolidation of the surface soil by the continuous tramping of stock in all weathers, as well as other causes, and in a few isolated cases there may be direct impoverishment of the soil.

When once the cause of the deterioration is known, the remedy is readily suggested, though it may not be possible to always carry the remedy out. With a pasture in good condition overstocking should be avoided as far as possible. There should be a greater number of paddocks, so that pastures can be spelled or rested in turn, and in a systematic manner. White clover should be sown more freely, and its spreading encouraged. It will spread very quickly with paspalum if given a chance to do so. Before deterioration in the pastures has taken place, and on lands where farm implements can be safely and economically used, the paddocks should be ploughed up and utilized for a season in growing a crop of some description. Strong ploughs should be used with plenty of pulling strength, and advantage taken of seasonable weather so that the soil itself should not be too hard. When the sod has been completely inverted, the old crowns that have lost their vitality, or the portions that are already dead, will readily decompose and become incorporated with the soil. This disturbing of the soil and the various natural agencies combine to promote conditions favourable to fertility. The young, vigorous shoots of old plants, or the young plants that may have germinated from seed that has hitherto lain dormant, will now have an opportunity of rooting and growing freely. The surface soil, being freed of the dense mass of old crowns, is better able to absorb moisture from rains. Accumulations of manure from stock which produce rank and unpalatable herbage is decomposed and mixed with the soil, and a healthier and sweeter pasturage is assured. This treatment has had the effect, wherever I have seen it carried out, of producing a pasture equal in all respects to the original, both as regards prolific growth and stock-carrying capacity, provided the weather conditions are favourable. On hillsides or areas not fully cleared of hardwood timbers, where the plough cannot be used, the method of treatment is not so easy. There are thousands of acres of this class of country which formerly carried splendid pastures, but have shown signs of deterioration, and where, up to the present, no attempt has been made to renovate them. Various remedies have been suggested, but to my mind the only method of dealing with these is to have a very strong cultivator made, of a special type, somewhat after the principle embodied in a stump-jump plough, whereby the tines, upon striking a root or other obstacle, would not break, but merely rise over it. What is wanted is an implement that will break the paspalum mat at the surface and loosen the soil, so that rains can penetrate and the young plants or vigorous shoots can take root. Spiked rollers or disc implements, to my mind, would not perform the work. As ploughing is a somewhat slow and costly operation, it is thought that such a type of cultivator, that would tear the surface, would enable a larger area, even on cleared lands, to be treated. Such, of course,

would not be nearly so effective as the plough, but it would be considerably cheaper, and as it would be beneficial, it could be availed of by a large number of dairymen who probably could not so readily afford the expense of ploughing up all their cleared lands. The efficiency of the work performed and the cost of carrying out will naturally be largely influenced by the condition of the soil as regards moisture. Wherever possible, such work should be done in the wet seasons, or when the soil is softened by a sufficient amount of rain. The necessity of preventing, if possible, too much consolidation of the surface soil, particularly on hill slopes, is readily apparent. Explosives, while effective for loosening subsoils, would not supply the present need in loosening the top soil and breaking up the dense mat of paspalum crowns.

A New Weed for New South Wales.—A Poisonous Buttercup (*Ranunculus sceleratus*, L.).

A. A. HAMILTON, Botanical Assistant, National Herbarium.

In Pammel's "Manual of Poisonous Plants," p. 111, *R. sceleratus*, "Cursed Crowfoot," is described as a very poisonous species, especially to cattle, since it grows in marshes along with other herbage, and is often eaten with other forage plants. It contains anemonol and anemonic acid.

The following is taken from "A Dictionary of the Economic Products of India," Watt, 1892, p. 392:—

The fresh plant is poisonous and produces violent effects if taken internally. Draughts of tepid water constitute the best remedy in cases of poisoning by these plants, by diluting the acrid juices on which their effects chiefly depend. It was formerly used in Europe by professional beggars to produce or maintain blisters or open sores intended to excite sympathy. The inhabitants of Wallachia used it as a vegetable when boiled, a remarkable fact when it is remembered that it is poisonous and a powerful vesicant when uncooked.

This weed was found by the writer growing in a ditch at Waterloo, which flows into the stormwater channel at Alexandria, thence, via Shea's Creek, into Cook's River. It is probably a recent introduction, as it has not yet got far afield. There is every prospect, however, of a considerable spread of this undesirable alien in the comparatively large area of low-lying marshy land in the neighbourhood of Cook's River, as the plant (which is an annual) seeds freely, and is provided in this district with an exceptionally suitable environment for propagation. These marshes are much used by local dairymen and horse-owners, for grazing purposes, especially during the summer months (the growing season for this plant), when other pastures are suffering from lack of moisture. So far as the writer knows it has only once previously been recorded from Australia, viz, Orbost, Snowy River, Victoria, 1905, by Professor Ewart, *Proc. Royal Society, Victoria*, Vol. XX, p. 86. Plants are being grown in the Botanic Gardens for the purpose of illustration in the "Weed Manual," which is in course of preparation by the Government Botanist.

The Prickly Pears of Interest to Australians.

J. H. MAIDEN,
Government Botanist, and Director of the Botanic Gardens, Sydney.

No. 7.—The Pear-fruited Prickly Pear (*Opuntia monacantha*, Haw.).

It has been described by many authors.

In my "Preliminary Study of the Prickly Pears Naturalized in New South Wales," this *Gazette*, September, 1898, page 1004, I described it as follows:—

Size.—Four to six feet. (It grows up to 18 feet high in Queensland.)
Joints.—Mostly spathulate; somewhat compressed; often more or less concave.
Spines.—Murderous spines, white, with brown tips, usually 2 inches long, but sometimes longer; very strong; often single, but not uncommonly two or more together; on the stem they are frequently in fascicles of six to twelve, and up to 4 inches long.
Bristles.—Bristles rare on the joints, but plentiful on the fruit, few near the narrower end, but increasing in numbers of tufts towards the scar.
Stigma.—Six-cleft (? constant).
Fruits.—Pear-shaped (3¼ inches x 1¾ inches), greenish-yellow outside, later suffused crimson, or with a red face like a russet apple; colour and flesh greenish-yellow; not bad eating, but a little acidulous.

It is a formidable looking pear, which can be distinguished from all others by its pear-shaped fruits and drooping habit, particularly when young. Strange to say, it is not as much feared as the Pest Pear, which *looks* very much less innocent. The present pear grows into a large plant, with a distinct stem, and each individual plant can be conveniently got at for poisoning if necessary. It does not possess the fatal facility for spreading that the Pest Pear does.

When not in fruit this Prickly Pear is sometimes confused with No. 3 of this series (*O. nigricans*, Haw.). See *Agricultural Gazette* for March, 1912, p. 208. The colours of the flowers are different also, and the habits of the two pears are different; but they both have formidable spines, and that they are confused by country people is a fact.

Non-Australian Localities.

It is a native of Brazil (Rio de Janeiro, Bahia, San Paulo) and of the Argentine.

It grows in Madeira, and probably in most countries of the world in which *Opuntias* are acclimatised.

As regards its spread in India, see Burkill's "Determinations of the Pears now wild in India" (*Records Bot. Survey, India*, iv, 292 [1911]).

Spread in Australia.

It is, perhaps, the only pear which is growing in every State of the Commonwealth.

In *New South Wales* I have seen it at Botany, South Head road, Manly, and the Sydney district generally, Bringelly, Windsor, Singleton, Scone, Coolabah. Doubtless there are many other localities.

As regards *Victoria*, it is not rare about Melbourne. See also Ewart and Tovey in *Journ. Agric. Vict.*, June, 1908.

In *Queensland*, Mr. A. T. Clerk informs me that 60 miles on both sides of the Suttor River are infested with this species. I have seen it near Brisbane.

Tasmania.—I have seen a plant in a garden alongside the street in Hobart, but could not learn that it had strayed.

Western Australia.—I have seen it in the Perth district, and also at Greenough road, near Geraldton, where there is a hedge of it.

Varieties.

1. *prolifera*, Hort.

In Botanic Garden, Palermo, Sicily, and Botanic Garden, Sydney.

Has smaller flowers, which are borne in the greatest profusion, the fruit more proliferous than the normal form.

2. *variegata*, Hort.

It is often advertised in nursery catalogues. I have not seen it, but those who have say, "It differs in no way from the species except in the unequal distribution of the green colouring matter in the joints" (*Bull.*, New Mexico, xi, p. 61).

We are casting about for enemies of the Prickly Pear, and the following paragraph from Burkill (p. 318, *op. cit.*), in regard to Indian experience is interesting :—

The wild cochineal insect introduced into India in 1795 spread so rapidly on *Opuntia monacantha* as to destroy it, branch and root, out of the countryside. The insect was introduced into both Bengal and Madras; but owing to the action of the Government of Madras in encouraging its propagation, it spread more rapidly there than in Bengal. It had almost done its work of destruction in Southern India in twenty years; but in the north it took sixty years to travel from Calcutta up the Ganges Valley and over the Punjab plain to Ludhiána—rather more than 800 miles away. Its progress through Bengal is unrecorded; but the Opuntia had become a pest in the Punjab, and its destruction made such a difference to the face of the country that writers promptly noticed and recorded what was happening.

Opuntia monacantha, thanks to the cochineal insect, which is still with us, is now a comparatively scarce plant. Its survival in Assam in greater quantity than elsewhere is due to the isolation, by reason of the submersion of the country in the rains, of sites suitable for it. The cactus, being used by man for fences, has been carried over the barriers, but not the cochineal.

The abundance of the cactus in India before its enemy, the cochineal insect, was introduced, seems to be proof that the Portuguese did not introduce the latter into India. I do not know any reason for stating, as has been done, that they probably did so.

O. elatior, Mill.

In this *Gazette* for September, 1898, I wrote as follows concerning the above :—

I proceed to give some information (for reference) in regard to the true *O. elatior*, and will only add that it does not appear to have run wild in any part of Australia.

O. elatior, Haworth, *Syn. Pl. Succ.*, p. 187* (Great black-spined), erecta articulis, late ovato-oblongis, spinis subulatis longissimis nigricantibus.

* *O. tuna*, var. *elatior*, according to *Bot. Mag.* t. 1557, and to Miller himself.

Opuntia (*elatior*) *articulis ovato-oblongis, spinis longissimis nigricantibus.* Mill. *Dict.* ed. 8, No. 4.

16. *O. elatior* (Mill. *Dict.* n. 4. Haw., *Syn.* 187). Erecta, articulis late ovato-oblongis, aculeis subulatis longissimis nigricantibus, lanugine obsoleta. In America calid. Dill. Elth. f. 379. *Cactus tuna* β. Willd. spec. 2. p. 944. Flores e flavo in purpureum vergentes. Stigma 5 fidum. Caulis adultus subteres ex. Jacq. (DC. *Prod.*, iii, 472.)

O. elatior.—Plant erect; joints broadly ovate-oblong; prickles subulate very long, blackish, with the wool from which they rise nearly obsolete. *Cactus tuna.* Willd. Flowers yellow, varying to purple. Stigma 5-cleft. Adult stem nearly terete ex. Jacq. (Don, iii, 173.)

It will be observed, therefore, that Miller, following Dillenius, defined the difference between *O. tuna* and *O. elatior* to consist in the "very long black spines" of the latter. An important characteristic of *O. elatior* is, probably, the possession of long black spines.

O. elatior.

Habit.—Erect. Adult stem nearly terete (Don).
Size.—Broadly ovate-oblong (Don).
Spines.—Subulate, very long, blackish (Don).
Bristles.—"The wool from which the spines rise nearly obsolete" (Don) on the joints, abundant on the fruits.
Flowers.—Yellow, varying to purple. Stigma, 5-cleft (DC., Don).

If we now compare the descriptions of *O. monacantha* and *O. elatior*, Mill., there seems to be very little difference between them. Perhaps they are identical, in which case *O. elatior* is the older name, but I have followed Kew in the use of the name *O. monacantha*, or rather, the *Bot. Mag.*

The joints of *O. monacantha* are stated to be obovate-oblong, and a foot long, while those of *O. elatior* are stated to be broadly ovate-oblong. The student of *Opuntias* knows that there is not much to rely on here, the joints varying so much in the same plant. The spines of *O. monacantha* are stated to be "solitary, subulate, strong," and those of *O. elatior*, "subulate, very long, blackish." There may be no difference in these definitions. The flowers are the same. I can find nothing else to take hold of. The case certainly seems one for further enquiry.

I received no replies to my enquiry. In his *Gesamtbeschr. der Kakteen*, published in 1899, Professor Schumann said he did not know what *O. elatior*, Mill., was.

Burkill (*op. cit.*, p. 293) says, however, that "it is exceedingly common in India," and that it is "associated with *O. monacantha* at Purneah, Calcutta." In other words, that two Opuntias are contrasted with each other in a certain locality, and I would be very glad to see what this plant is. The matter is further alluded to by Burkill at pp. 297 and 298. At p. 300 it is stated that it is "one of the five Opuntias now wild in India."

On p. 301, "Roxburgh and Anderson, experimenting with the wild cochineal, had found that it would not feed on *Opuntia elatior*, but grew on *O. monacantha.*"

I am quite satisfied that two distinct species are here referred to, but in view of the very great confusion which has gathered around *O. elatior*, and my pathetic appeal for enlightenment already quoted, I should be very grateful if some Indian correspondent would favour me with material which would enable me to say under what name the Indian *O. elatior* goes in New South Wales.

Bluestone with and without Lime.

A CORRESPONDENT draws attention to the apparent conflict between the fact that in treating wheat for bunt, the bluestone should not be previously neutralised by mixing with lime, as it would impair the working value of the bluestone, whereas the Bordeaux mixture must contain lime, and be carefully neutralised before using.

In reply, Mr. H. Ross, Chief Inspector, states that when spraying with Bordeaux mixture for fungoid diseases on fruit trees, the neutralised sulphate of copper has the effect of destroying the fungi which may be present. Such is not the case when the same mixture (Bordeaux) is used for the destruction of bunt spores adhering to the outside of a grain of wheat. In this latter case, it is necessary to have a strong solution which has a corrosive action, strong enough to kill these spores, and therefore bluestone alone is used. The subsequent dipping in lime water is resorted to in order to destroy the corrosive action of the bluestone when once it has fulfilled its function in having destroyed the bunt spores.

The Algaroba or Mesquite Tree (*Prosopis juliflora*).

THIS is looked upon as the most valuable tree introduced into Hawaii. In those islands it thrives best in comparatively dry localities, and is somewhat sensitive to salt air according to some authorities, while the experience of others shows that it flourishes not far from the sea-shore in sheltered situations. This tree covers from 50,000 to 60,000 acres below an elevation of 1,000 feet in the leeward districts of the larger islands of the group.

It is a most valuable tree for forage, bearing a profusion of small yellow beans, which are highly fattening. It should therefore be well tested by owners of stock; it affords grateful shade, and its flowers form the most important source of honey in Hawaii.

The Under Secretary has received a small quantity of seed, and applications for small packets of it will be received from farmers and land-owners in the warm coast districts not further south than the Hunter. Applications should be addressed: "*The Director, Botanic Gardens, Sydney,*" and will be filled in order of application. The seeds should be sown at once.

Trials of Imported Peanuts.

THREE varieties of peanuts, new to this State, were tried during the past season at Hawkesbury Agricultural College and Grafton Experiment Farm, the seed having been obtained from America through the kind offices of the United States Department of Agriculture.

At the College these imported varieties, Spanish, Valencia or Tennessee Red, and Virginia Bunch, suffered more during the hot, dry months of summer than the local or New South Wales variety, with which they were tried in comparison. Taken as a whole the imported varieties proved more upright in growth and of a darker green than that better known here. Unfortunately actual yields could not be ascertained, owing to the very wet weather in May and June flooding part of the land, but the Experimentalist regards them worthy of further trial.

At Grafton Experiment Farm, where only the imported varieties were tested, the germination was bad, and the plants were subjected to unfavourable conditions throughout their growth. They were lifted on the 5th May, the weights of marketable peanuts being taken on the 27th of the same month :—Spanish (two plots), 14¾ lb. and 15 lb. respectively ; Valencia (one plot), 16 lb. ; Virginia Bunch (one plot), 26 lb. On an acreage basis this ranged from 3 cwt. 2 qrs. 11 lb. to 6 cwt. 2 qrs. 11 lb. per acre. An estimation of the mouldy, empty, and otherwise unmarketable pods was made, with the result that Virginia Bunch was found to have 14 per cent. unmarketable ; Spanish, 7 per cent. ; Valencia, 5 per cent.

As to the habits of the plants, the experimentalists at the institutions remarked that the three imported varieties had the same habit of growth, being more erect than that known locally. The pods are borne in profusion on short, red stalks which come away from the stems and penetrate the soil, eventually ripening the seed-pod at about an inch below the surface.

Spanish.—At the College this variety germinated badly, but withstood the summer the best of the imported varieties, and at the end of the season was regarded as producing the best flavoured nut. The pods were thin and small, and at Grafton were observed to always contain two peas.

Valencia or *Tennessee Red.*—The germination was good at the College, and the early growth vigorous, but being apparently later than the other sorts, many peanuts were rotted before ripening, in consequence of the excessively wet weather. At Grafton the pods were found to each contain three tightly packed peas, red in colour. The flavour was regarded as better than any of the varieties grown at this Farm.

Virginia Bunch.—Like the other imported varieties, this flowered at the same time as the New South Wales peanut at the College, and both there and at Grafton the crop was heaviest of all, but many pods were found to be

empty, though some were exceptionally large—in the case of Grafton, up to nearly 2 inches long and 1 inch wide. The pods were very regular in shape, and each contained two pink nuts.

The local, or New South Wales variety, was only grown in comparison at the College, but it proved the most prolific there, the nuts being fairly large, and the flavour inferior only to the Spanish. They were more difficult to harvest than the American varieties, owing to the spreading nature of the growth.

Further experiments will be carried out with these varieties, and possibly the results will be even more favourable as the seed becomes acclimatised. All the seed saved will be required for resowing at the various Experiment Farms, consequently none is yet available for distribution to the public.

How to make Bordeaux Mixture adhesive.*

At the last March meeting of the Academy of Sciences, Messrs. V. Vermorel and F. Danthony indicated the results of investigations carried out by them at the Viticultural Station of Villefranche-sur-Saône on the processes adopted for the purpose of giving adhesive properties to spraying mixtures used for vines.

The following are the principal conclusions: the addition of gelatine permits of solutions being obtained having great superficial viscosity, and we have advised its addition to the copper mixtures to make them adhesive. Gelatine in doses varying from 3 to 8 oz. per 100 gallons can be used for Paris green and for acid Bordeaux and Burgundy mixtures. On the contrary we have found that in the alkaline mixture the soda present renders the gelatine insoluble, thereby diminishing its superficial viscosity.

We have consequently looked for a substance, costing little, which could take the place of gelatine. Among the substances we tried casein has given the best results. It is sufficient to add to a Bordeaux mixture prepared in the ordinary way from 3 to 8 oz. of casein, first dissolved in a small quantity of milk of lime, to obtain a very adhesive spraying mixture. In an acid mixture casein would become insoluble and consequently inactive.

A few notes may be added to this information. Acid mixtures are those which turn red the blue litmus paper. They are little used here, if at all. Milk of lime can be easily made by mixing some of the slacked lime with water sufficient to make into a milky liquid.

In a further communication Messrs. Vermorel and Danthony suggest that the casein should be dissolved by the following process: mix intimately 3½ oz. of powdered burnt lime with 1½ oz. of powdered casein. Add to the mixture very little water and work it well into a paste. Thin it down with successive small quantities of water till about a quart of liquid is obtained, which is then to be added to the Bordeaux mixture.

* Translated from the *Journal d' Agriculture Pratique*, 1913, tome I, No. 22, p. 679.

Potato Experiments, 1912-13.

A. J. PINN, Inspector of Agriculture.

A.—Miscellaneous Trials.

DURING the past season seven experiments were carried out with various "Blight Preventive" specifics, but owing to the absence of Irish Blight in any of the crops treated and untreated, no information could be obtained as to their merits.

In the treatment of seed with formalin little difference was found in the germination of the different plots, but in the treatment for scab, the strong solution of formalin, 1 lb. to 30 gallons of water, also lime-sulphur, 1 gallon to 12½ gallons of water, and bluestone 1 lb. to 40 gallons—all immersions for two hours—considerably injured the germination. The weak solution of lime-sulphur, 1 gallon of concentrated to 50 gallons of water, was not effective against scab. The most suitable solution appears to be 1 lb. formalin to 40 gallons water.

An experiment to determine whether the application to the soil of sulphate of iron, at the rate of 1 cwt. per acre, acts as a preventive against Irish Blight, was carried out at Glen Innes Experiment Farm, but as the disease did not appear in any crops treated or untreated, no conclusion could be drawn on this point, but the plots to which sulphate of iron was applied gave a heavier yield and the tubers were of better size.

The tubers produced from the hybridised seed obtained from the late Dr. John Wilson, of the Scottish Agricultural Commission, were grown at Millthorpe. The bulk of the tubers were of good shape, some of them weighing 3 oz. This must be considered satisfactory, seeing that it is the product of only the second generation. The whole of the progeny are white in colour. The cross-bred No. 125 (British Queen x Myatt's Kidney x Maincrop [2] x New Zealand var. [2]) was again the most prolific.

The seven Scotch varieties were also grown at Millthorpe. Some of these are very promising, especially Rector (red), Mac (red), Prior (white), and Kate Kennedy (white), and as the quantity of seed has now considerably increased, it is intended to include the varieties in the variety trial of the Farmers' Experiment Plots at Millthorpe this coming season. A good idea should thus be obtained of the yielding qualities of the new varieties. The variety "Bejant," which made a bad showing last season also did badly this season, and consequently has been rejected.

The growing of the local cross-breds was continued at Bathurst Experiment Farm. The most promising cross is one with Manhattan as a parent, the resulting potato being a good-looking, round redskin, with small white blotches, with a very red shallow eye.

Acclimatised seed of the four New Zealand varieties, viz., Princess Victoria, Willowbridge Wonder, Dreadnought, and Early Favorite were grown at Millthorpe and Red Range. The results were again very poor, and the varieties were discarded, as it was considered none of them was likely to replace any of the local varieties now in cultivation.

As no Irish Blight appeared in the tableland potato crops, no conclusions could be obtained from the various spraying experiments.

B.—FARMERS' EXPERIMENT PLOTS.

A. J. PINN, Inspector of Agriculture.

POTATO experiments were conducted in fifteen districts in the State, the trials comprising variety and manurial tests. In each plot seven varieties of potatoes were included, and two manure mixtures were tested against the no manure. The plots ranged in area from 1 to 5 acres.

The season experienced was, on the whole, unfavourable, being characterised by a dry summer. In addition, an attack of Rutherglen Bug caused a considerable amount of damage to the early varieties, resulting, in some cases, in total failure. The late varieties, viz., Coronation, Queen of the Valley, and Surprise, were practically free from attack, and were better able to respond to the late rains.

The varieties Surprise and Freeman were found to be identical, and, as the original Freeman, imported from America over twenty years ago by Mr. Rumsey, was a white potato, it was decided to name the variety Surprise. This potato, which is a light redskin, was previously little known in the South, and as a result of being included in the experiment plots in the various localities where the farmers had an opportunity of seeing it, the variety is now in much demand. It produced few small potatoes, and there was an absence of second growth. Its cooking qualities were unsurpassed by any other variety. On rich, new land, unless planted fairly close, it has a tendency to become too large, in which case many tubers are hollow. Because of its liability to grow large tubers in rich land, it is recommended by the western farmers as the best potato for poor soils. On account of its lateness, it is not likely to be suitable for North Coast conditions.

In the Crookwell district, where the area under potatoes—about 5,000 acres—was the largest of any locality in the State, a large area was planted with the Magnum Bonum variety. This is a late white potato, rough in appearance, and poor in cooking qualities. It does not find favour on the market, and growers would be wise in curtailing the area of the variety in future plantings. It would be better if late varieties, such as Queen of the Valley, or Surprise, were substituted, but seed of the latter is somewhat scarce this season.

The average yields of the experiment plots were as follow:—

Variety.	Number of Trials.	Average Yield per acre.		
		tons	cwt.	qrs.
Coronation	15	5	8	2
Queen of the Valley	15	4	12	2
Surprise	14	4	4	3
Manhattan	14	4	2	1
Brownell's Beauty	14	3	10	0
Satisfaction	14	2	19	2
Bliss' Triumph	13	2	16	3
Up-to-date	5	2	12	1

The following are the average yields in the manurial experiments :—

Manures.	Number of Trials.	Average Yield per acre.		
		tons	cwt.	qrs.
P4 Manure	15	4	17	2
P5 Manure	15	4	14	2
No Manure	15	3	11	1

The manure mixtures used were as follows :—

P4 Manure : 4 cwt. sulphate of ammonia,
13 cwt. superphosphate,
3 cwt. sulphate of potash,

applied at the rate of 4 cwt. per acre.

P5 Manure : 16 cwt. superphosphate,
4 cwt. sulphate of potash,

applied at the rate of 4 cwt. per acre.

It is worthy of notice that only in one instance, viz., Guyra, was there no increase of the manured plots over the unmanured.

The increased yields due to fertilising are again sufficiently high to warrant a larger use of manures by the potato growers of this State than is now the case.

(1) WESTERN DISTRICT.

Owing to there being no inspector in this district during the past season, only one plot was established, viz., at Messrs. Noonan Bros.' farm, Millthorpe.

The plot was 5 acres in extent, the soil of which was the red volcanic, typical of the surrounding country. Previous to planting—the middle of November—the land had been well fallowed.

The yield of the plot was as follows :—

	tons	cwt.	qr.
Variety Trial—			
Queen of the Valley...	5	10	3
Coronation	4	11	1
Manhattan	3	18	0
Surprise	3	13	0
Brownell's Beauty	2	14	2
Satisfaction	2	13	3
Bliss' Triumph	1	16	2
Manurial Trial—			
P5 manure	5	19	2
P4 manure	5	10	3
No manure	4	4	2

The early varieties were attacked by Rutherglen bug and were affected by dry weather. The late varieties were benefited by the late rain, but were cut down by frost before fully grown. A difference in growth between the manured and unmanured plots was apparent throughout the whole season.

(2) SOUTHERN DISTRICT.

H. C. STENING, Inspector of Agriculture.

POTATO experiments were conducted during last season in six districts in the Southern Division of the State.

The names and addresses of the experimenters are as follow:—

Mr. O. E. Silk, "Woodbine," Nimitybelle.
Mr. A. J. Rial, Wolseley Park, near Tumbarumba.
Mr. A. E. Herring, "Glen Rock," Batlow.
Mr. A. S. Boys, Crookwell.
Mr. A. F. Carr, "The Hickories," Chatsbury.
Gininderra Farmers' Union, Gininderra.

Gininderra, which is situated in the Federal Capital Territory, is not regarded as a potato district, but it was thought that if only moderate crops could be produced, potato-growing would prove profitable, owing to increasing local demand. On account of unfavourable weather conditions, and an attack of Rutherglen bugs (*Nysius vinitor*), the experiment resulted in a total failure.

Nimitybelle.

The soil at this plot, which was 5½ acres in area, was a chocolate loam of basaltic origin, which had been cultivated for a number of years, but had never been cropped previously with potatoes.

The land was ploughed in May and allowed to fallow, the surface being cultivated to destroy weeds and to maintain a soil mulch. The planting was made from 30th October to 2nd November, the sets being placed 18 inches apart in rows 2 feet 9 inches apart. The germination was perfect, and the young crops were hilled early in December. Severe frosts on 12th and 13th December completely cut the whole of the crops; but fresh growth was made; the stand, however, was not quite so good as prior to the frosts. The crops were cut by a hailstorm on 11th January, and were frost-bitten on 17th March, but no very great injury resulted. Digging was commenced towards the end of April, and Frost-proof, Early Rose, and a portion of the Coronation plot, manured with P5 fertiliser, had been harvested, when rain set in, and it continued to rain and snow throughout most of the winter. This delayed harvesting, with the result that a considerable proportion of the potatoes was destroyed. As opportunity was afforded, when the land was in a suitable condition for digging, portions of the higher land of each plot were harvested, and the yields per acre calculated. The yields given in the table are those of sound tubers produced; in the case of the plots harvested after the rain, it is estimated that on an average fully one quarter of the crop was destroyed.

Wolseley Park.

The soil was a virgin chocolate loam, ploughed in August, and the surface kept loose until planting time. The sets were planted on 20th November, about 18 inches apart, in rows 2½ feet apart. The crops were hilled in

January, and were harvested on 5th July with the Iron Age potato-digger. The earlier maturing varieties were attacked by the Rutherglen bug, and their yields as a result were considerably reduced.

Batlow.

The soil was red basaltic, typical of the soil of the district. It had been planted with potatoes the previous season, but had resulted in a failure owing to the dry conditions. The land was fallowed in July, and the planting made on 14th and 15th November, in rows 2½ feet apart. The crops were cultivated twice between the rows. Owing to the damage wrought by the Rutherglen bug, the early varieties failed, and the yields of the later varieties were also affected.

Crookwell.

The soil on this plot was typical of the lighter soil of the district. The plot was deeply ploughed at the end of August and well worked until planting, which took place at the end of October and beginning of November. The summer was very dry, and the Rutherglen bug caused a great deal of damage to the early varieties. The plot was continually cultivated throughout the season, and it is due largely to this constant working that such satisfactory yields were obtained. A large area of the plot was harvested with the Iron Age potato-digger.

Chatsbury.

The soil was a red basalt, which had been fallowed since early August. The planting, which was done on 25th October, with an Aspinwall potato-planter, resulted in a faulty stand, fully 20 per cent. of the land not being planted. The following summer months were very dry, and the early varieties were badly affected with Rutherglen bug. Various sprays were experimented with, in order to cope with the attack of bugs, but none proved effective.

TABLE A.—Showing Yields of Varieties per acre. (Manured with P4 potato fertiliser at the rate of 4 cwt. per acre.)

Variety.	Nimitybelle.	Wolseley Park.	Batlow.	Crookwell.	Chatsbury.	Average Yield per acre.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
Surprise	11 12 0	7 1 2	3 10 1	4 18 0	2 0 0	5 16 1
Coronation	7 1 0	7 8 0	3 14 1	5 14 2	3 2 3	5 8 0
Queen of the Valley ...	6 9 0	4 19 0	2 1 1	5 11 0	3 2 1	4 8 2
Manhattan	5 7 0	4 7 1	Failed	3 18 1	0 15 2	3 12 0
Brownell's Beauty ...	6 17 0	2 14 2	Failed.	2 18 3	0 16 3	3 6 3
Bliss' Triumph	2 13 0	1 17 2	Failed.	2 8 0	0 14 3	1 18 1
Satisfaction	2 8 0	1 15 0	Failed.	2 8 0	0 17 3	1 17 1

In addition, Frost-proof was planted at Nimitybelle for the first time in these experiments, and its yield amounted to 3 tons 3 cwt. per acre. Frost-proof, otherwise known as Monaro Marvel, did not bear out the ability to withstand cold that its name would imply. It was completely cut by the

frost on 12th December, and the subsequent stand, if anything, was poorer than the other varieties. It has probably received its name by reason of its extreme earliness, enabling it to be planted late in the season, and yet escape early frosts.

Surprise was also planted for the first time, and the introduction of this variety may be regarded as a signal success. In addition to heading the averages with a yield of 5 tons 16 cwt., the individual yield of 11 tons 12 cwt. at Nimitybelle is remarkable, especially so as this represents the yield of sound tubers only, a fair proportion having been destroyed by the excessive rains since the maturity of the crop. A fact also worthy of note is the very small percentage of tubers that were not of marketable size. This variety and Coronation proved the most resistant to the attacks of the Rutherglen bug. This pest paid most attention to the early varieties, over which it literally swarmed, sucking the plant juices and giving the crop the appearance of having been cut by frost. It is due to its depredations that Satisfaction, Bliss' Triumph, Brownell's Beauty, and Manhattan produced such low yields on some of the plots; Nimitybelle is the only plot where the crops were not affected by the bug.

Manurial Experiment.

Three plots were allotted in each district to a test with manures. In addition to an unmanured plot, plots were manured with the special potato fertilisers P4 and P5 at the rate of 4 cwt. per acre, the manure being spread along the furrows by hand. With the exception of Crookwell, where Queen of the Valley was used, Coronation was the variety used throughout these tests.

TABLE B.—Manure Test. Yields per acre.

Manure.	Nimitybelle.	Wolseley Park.	Batlow.	Crookwell.	Chatsbury.	Average Yield per acre.
	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.	t. c. q.
4 cwt. P4 fertiliser per acre.	7 1 0	7 8 0	3 14 1	5 11 0	3 2 3	5 7 1
4 cwt. P5 fertiliser per acre	5 14 0	7 19 0	3 6 0	4 18 2	3 13 2	5 2 0
No manure	4 3 0	5 7 1	2 0 1	4 0 3	2 10 3	3 12 1

These results demonstrate the value of manuring. The plot manured with the P4 fertiliser yielded an average increase of 1 ton 15 cwt. per acre for an expenditure of 31s. for manure.

The addition of the nitrogenous manure—sulphate of ammonia—resulted in an increase at three of the plots.

The virgin land at Wolseley Park did not respond to the application of sulphate of ammonia. This is probably owing to the fact that the new land was well supplied with humus, and it appears to show that if the humus content of our potato lands were maintained, there would be no necessity for the use of expensive nitrogenous manures.

(3) SOUTH COAST DISTRICT.

R. N. MAKIN, Inspector of Agriculture.

In all, five plots of potatoes were planted on the South Coast, viz., Albion Park, Kangaroo Valley, Moruya, Pambula, and Mittagong. The ground in every instance had been well ploughed some months ahead of planting, and good soaking rain fell during July, amounting to as much as 13 inches at some stations. Dry weather followed and the plots were cross-ploughed, the first plot being sown 21st August, 1912, and the last 4th September, 1912. Early planting was considered advisable in order that the crops might benefit from the winter rains before the usual dry spring set in.

Germination was good in all except two varieties—Surprise and Up-to-date—and the crops made great headway until a particularly heavy frost occurred on 15th October, when all the plots were cut to the ground. There is no doubt that this seriously affected the yields. The crops sent out fresh shoots. In some cases November rains were satisfactory, but very dry weather conditions prevailed afterwards when the potatoes were forming.

In all cases the plots were well tended, and although in some instances the returns are low, information of practical value has been obtained.

There were eight vari ties of potatoes sown—one-tenth acre each—and a manurial trial with two different mixtures and an unmanured plot at each centre. The following were the yields :—

TABLE A.—Variety Trials. Yields per acre. South Coast.

Variety.	Mittagong.	Pambula.	Moruya.	Kangaroo Valley.	Albion Park.	Average.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Manhattan ...	1 19 0 12	7 11 3 14	3 1 1 0	6 7 2 0	1 17 2 0	4 3 0 5
Brownell's ...	1 5 2 24	6 8 3 0	2 7 0 0	6 4 0 12	1 15 1 12	3 12 0 22
Bliss' Triumph...	1 8 1 16	4 10 0 0	2 2 0 0	5 7 2 20	2 0 0 20	3 1 2 16
Up-to-date ...	1 7 2 0	3 15 1 12	2 6 1 16	4 5 0 11	1 7 1 8	2 12 1 9
Queen of Valley	1 15 0 0	7 0 2 4	2 16 0 6	5 8 3 0	1 17 2 0	3 15 2 7
Coronation ...	1 11 0 18	10 2 2 10	5 0 0 10	6 3 0 16	2 2 3 12	4 19 1 13
Surprise ...	1 19 1 4	2 6 2 12	1 17 0 16	Failed.	1 4 0 12	1 16 3 4
Satisfaction ...	2 9 1 4	4 10 2 14	3 0 0 10	2 13 2 8	1 13 3 0	2 17 1 24

TABLE B.—Manurial Trial, South Coast. Variety—Satisfaction.

	P5.	P4.	Unmanured.
	t. c. q. lb.	t. c. q. lb.	t. c. q. lb.
Mittagong	1 16 3 4	2 9 1 4	1 5 2 14
Pambula	4 15 0 0	4 10 2 14	1 16 1 20
Moruya	3 2 0 6	3 0 0 10	2 10 1 2
Kangaroo Valley	2 18 1 16	2 13 2 8	2 10 1 2
Albion Park	1 17 2 0	1 13 3 0	1 1 1 20
Average per acre	2 17 3 22	2 17 1 24	1 16 3 6

The manurial trial is of interest. The mixtures were applied at the rate of 4 cwt. per acre, and were dusted along the drills prior to planting the potatoes. In every instance, with one exception, there is a balance in favour of P5. The fact that nitrogen might be eliminated in a potato fertiliser means a cheaper manure, as it is an expensive ingredient.

P5, compared with unmanured plots, shows an increase of 2 tons 18 cwt. 2 qrs. 8 lb. per acre on the Pambula plots, a return which surely justifies the application. Had better weather conditions prevailed, much better returns would have been secured throughout.

Of the varieties, Coronation holds the pride of place with an average of nearly 5 tons per acre; at Pambula it averaged 10 tons per acre, and some of these potatoes were exhibited at the Royal Agricultural Show, attracting considerable attention. Coronation is a late maturing variety and somewhat inclined to take second growth, and is not so reliable as Early Manhattan.

Manhattan fills second place, and is a good variety for coastal conditions, being very popular in some districts.

Queen of the Valley, a rather rough, red-skinned variety, is likely to become popular on account of its productivity. There is no doubt it suits the coast well, and will respond to liberal manuring.

A very satisfactory sample of Brownell's Beauties was sown, giving satisfactory results.

Bliss' Triumph and Satisfaction were about equal in returns.

Up-to-date and Surprise were disappointing on account of poor germination. Up-to-date made nice even tubers where any matured, and Surprise yielded some large-sized tubers, but few in number. This variety appears to be suited to the lighter soils.

The crops were all particularly healthy as regards fungus troubles. In some cases cut-worms and the potato moth were troublesome.

(4) NEW ENGLAND DISTRICT.

A. H. E. McDONALD, Inspector of Agriculture.*

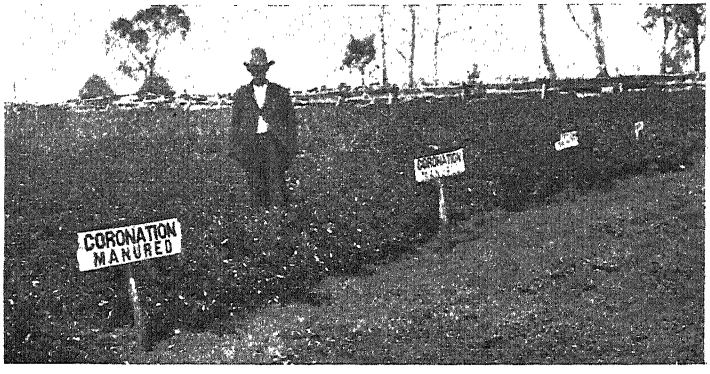
THE past season was not very favourable to crop growth. Shortly after the planting season—October and November—very hot dry weather set in, and continued until after the majority of the potato crops had flowered. This reduced the yields of most of the crops considerably in New England. One or two localities, such as Guyra and Ben Lomond, were well favoured with rain, but most of the growers suffered from the adverse season. The early crops suffered severely, as the rain which fell late in the summer did not benefit them to a great extent. Late sown crops which escaped the early frosts yielded fairly well. Many of these were, however, cut by frost.

From the experiment plots good yields were obtained, although the crops had to bear the brunt of the hot dry weather. The driest conditions

* Now Manager, Coonamble Demonstration Farm.

prevailed at Black Mountain and Tenterfield, and yet at both of these centres satisfactory yields were obtained.

On all the experimental plots, what is considered good farming practice is followed. The land is systematically fallowed, fertilisers are used, and good seed is planted. Everything is done to ensure that the crop is well supplied with both moisture and food.



Potato Experiments. The Plots on Mr. W. Moore's Farm, Guyra.

Many growers assume that in New England, which has a high annual rainfall, it is not necessary to fallow to conserve moisture. This is not the view held by the Department of Agriculture. It believes that fallowing is just as essential as in the dry districts. This view is based on the fact that in seasons when the rainfall is very high the yield of potatoes is also high. Such seasons rarely occur, and the logical conclusion is that the supply of moisture is generally insufficient. Knowing that moisture can be conserved by cultivation, measures are taken to ensure that this is done. The system practised is as follows :—The land is ploughed deeply about the beginning of June; this, besides exposing it to the sweetening effect of the air and sunlight, enables it to absorb rain freely. After all heavy falls of rain, the surface is loosened with a tined cultivator. This retards evaporation of moisture and opens the soil to the air again. Several cultivations are given. In October or November, when it is decided to plant, the land is again ploughed and the sets dropped and covered at the same time. If heavy rain falls before the plants appear, the land is harrowed, and it is again harrowed when they are about 4 inches high. Then during the growth of the crops shallow cultivation between the rows is freely given.

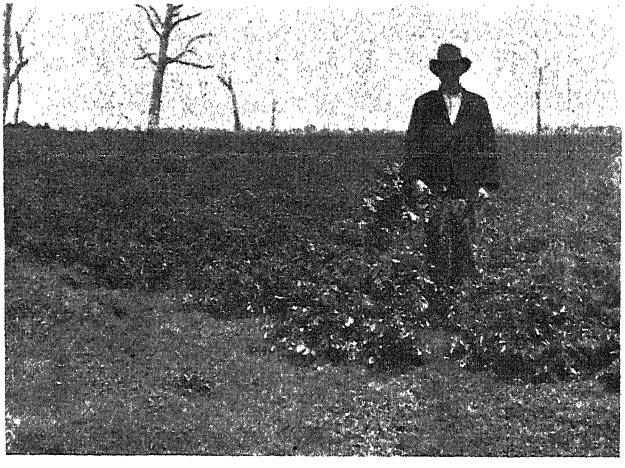
Fertilisers have been found very beneficial, and all plots, with the exception of those required to serve as a check, are given about 4 cwt. per acre. P4 fertiliser costs, roughly, about £1 10s. per acre, and as it gave an average increase of 1 ton 1 cwt. per acre, the benefit is very apparent. On

poor land such as was dealt with at Black Mountain and Tenterfield, the profit was very much greater. At the former place the increase was 1 ton 14 cwt. 3 qrs.

The composition of the fertiliser is given elsewhere. On most of the experiment plots it was applied by scattering by hand along the open furrows before the potato sets were dropped. Large areas could be treated by applying the fertiliser with a corn-dropper along the furrow before the sets are planted. This method was practised at Tenterfield.

There is not the slightest doubt of the necessity of using fertilisers on most of the New England soils. By its means even the grey soils, which are considered rather poor for potatoes, can be made very productive.

As will be seen from the results, the P4 fer iliser was the most effective. On reference to the composition of the two, it will be seen that it differs mainly from P5 in that it contains sulphate of ammonia, a nitrogen-giving ingredient. There is no doubt that a complete manure—that is one supplying phosphoric acid, potash, and nitrogen—is required for the New England soils.



Russell's Seedling Potatoes on Mr. W. Moore's Farm, Guyra, showing Mr. Moore pulling out run-out plants. He says, "I have only been doing this latterly, and I ought to have been doing it all my life."

Seed and Varieties.

Only good sound seed was planted. This was partly responsible for the good yields. The young plants start away well, and always remain vigorous and sturdy. They are well nourished in their young stages, and this appears to have a beneficial effect upon the whole growth. The best results were obtained from Queen of the Valley, Manhattan, Surprise, and Satisfaction. These all gave high yields, and produced no second growth. Coronation gave a high yield, but produced much second growth, except at Guyra, where conditions were very favourable.

Location of the Plots.

Tenterfield.—The experiments here were under the care of Mr. J. Chick. The soil was a fairly deep, greyish loam of friable character and medium fertility. It is of blue granite formation.

Guyra.—Mr. Wm. Moore, senior, conducted the experiments. The soil is amongst the best in New England. It is a friable red loam of volcanic formation.

Black Mountain.—The plots were on Mr. Sharon Collins' farm. The soil was chiefly greyish loam with a patch of red loam. It was fairly friable and of medium quality.

Red Range, viâ Glen Innes.—Mr. Theo. Farlow conducted the experiments. The soil was red loam of volcanic formation, deep, and friable.



Potato Experiments. The Plots on Mr. J. Chick's Farm, Tenterfield.

TABLE A.—Variety Trial, New England, 1912–13.

Variety.	Guyra.				Tenterfield.				Black Mountain.				Red Range.				Average.			
Date planted...	5 Nov., 1912.				31 Oct., 1912.				7 Nov., 1912.				13 Nov.,1912				.....			
	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.	t.	c.	q.	lb.
Coronation ...	7	10	2	0	5	5	3	0	6	3	0	0	5	17	1	0	6	4	0	14
Satisfaction ...	5	0	1	0	4	13	0	0	2	14	3	0	4	14	3	0	4	5	0	15
Brownell's Beauty	3	11	0	0	4	5	3	0	2	12	3	0	4	8	0	0	3	19	0	14
Surprise	7	6	1	0	3	10	1	0	4	16	1	0	3	12	3	0	4	16	1	14
Manhattan ...	5	8	1	0	4	6	0	0	3	14	2	0	5	2	1	0	4	12	3	0
Freeman	6	17	3	0	3	15	0	0	4	17	3	0	4	8	2	0	4	19	3	0
Bliss' Triumph ...	4	6	2	0		.....			2	12	3	0	4	9	2	0	3	16	1	0
Queen of the Valley	6	2	2	0	6	14	0	0	5	7	0	0	4	15	1	0	5	14	2	21

P4 Fertiliser was applied to all varieties at the rate of 4 cwt. per acre.

TABLE B.—Manurial Trial, New England, 1912-13.

Place.	Variety.	Fertiliser per acre.	Yield per acre.	Increase.	Decrease.
			t. c. q.	t. c. q.	t. c. q.
Tenterfield...	Queen of the Valley.	P4—4 cwt.	6 14 0	1 9 2	.....
		P5—4 cwt.	6 6 2	1 2 0	.....
		Nil.	5 4 2	.....	.....
Black Mountain	Coronation...	P4—4 cwt.	6 3 0	1 14 3	.....
		P5—4 cwt.	5 6 1	0 18 0	.....
		Nil.	4 8 1	.....	.....
Guyra	Coronation...	P4—4 cwt.	7 10 2	.....	0 5 1
		P5—4 cwt.	7 2 3	.....	0 13 0
		Nil.	7 15 3	.....	.....
Red Range, *viâ* Glen Innes	Coronation...	P4—4 cwt.	5 17 1	1 6 3	.....
		P5—4 cwt.	6 0 1	1 9 3	.....
		Nil.	4 10 2	.....	.....

AVERAGE Yields in Fertiliser Plots.

Fertiliser.	Average Yield per acre.	Average Increase.
	t. c. q. lb.	t. c. q. lb.
P4	6 11 0 21	1 1 1 21
P5	6 3 3 21	0 14 0 21
Nil.	5 9 3 0	.....

MAIZE FOR ENSILAGE.

A CORRESPONDENT at Moss Vale asks the correct amount of corn to sow per acre, with a drill, for ensilage, in rows 21 inches apart, and also in rows 7 inches apart.

In reply, Mr. H. Ross, Chief Inspector, states that the Department recommends sowing maize in drills 3 feet apart, in order that cultivation may be carried out between the rows to conserve moisture and destroy weeds. If planted at the distances indicated by the correspondent, horse cultivation would be impracticable. The quantity of seed varies according to the size and shape of the grain. If sown 21 inches apart, from 20 to 25 lb. of seed per acre would be required, if sown 7 inches apart, at least one bushel would be necessary.

Horse Breeding.

The Foal.

[Continued from page 774.]

H. W. POTTS, Principal, Hawkesbury Agricultural College.

The remark is frequently made by oversea breeders that foals in Australia have the appearance of being either forced or very precocious in growth and activity. This is simply the result of climatic influence. In cold countries young stock do not thrive with such vigour as where the natural conditions are healthier and more favourable to early development and rapid growth. Under such generous and stimulating conditions as exist here, we are enabled to rear foals, calves, and lambs in the open, without the coddling and with less of the interference that artificial shelter and food involves.

In the majority of cases little or no attention is entailed by the arrival of a strong and lusty foal. He may be seen in a few minutes struggling on to his legs, and with wobbly exertions making his way to his mother for warmth and nourishment; while the mare, on her part, exhibits a maternal solicitude for her offspring, and commences to lick its body. As soon as the foal comes into contact with the warm body of the mother, an instinctive craving for food sets in, the lips pucker up, and a process of exploration results, with the aid of the mother, in the discovery of the sources of supply, and a gurgling in the throat gives evidence of satisfaction.

The first natural flow of milk, which is termed "colostrum," varies in composition from normal milk, and is quite essential to the wellbeing of the young. In the case of the mare, it lasts from fifteen to twenty-four hours. It contains an active principle, which has a specific cleansing effect on the mucous surface of the alimentary tract of the young animal, and being laxative in its action in much the same way as castor oil, it frees the tract from the mouth to the anus of all pre-natal accumulations. Its effect may be observed in the slimy, foul, greenish or soft yellowish-brown fæcal discharges which appear about two hours after the first suckle. The colostrum, in addition to its important sanitary influence, has also the effect of stimulating and bringing into activity the fermentative and digestive functions which are so essential to thrifty growth. It contains a higher percentage of albuminoids than the normal milk, and it is therefore more nourishing, and readily assimilated. Breeders have long realised that the best natural aids for development constitute the bedrock of successful rearing, and at this stage they exhibit a keen interest in their foals, quietly observing the maternal instincts of the mother and the condition of the foal.

Where symptoms of healthy action are absent, intervention is often necessary. If the foal scours or shows evidence of diarrhœa, the diet of the mare must be investigated, and improper food or foul water removed. An unclean paddock, wet ground, exposed situation, or bleak winds, may all provide causes for the condition, and should be corrected by the removal of the mare and foal, if possible, to a more suitable place. At other times a dose of castor oil may be required.

Constipation may occur as a result of the failure or insufficiency of the colostrum, or it may again be due to the mare's diet, which can be improved by giving greenstuff, bran mashes, and other food of a laxative nature.

Constipation is manifested in the foal by uneasiness and restlessness, the tail stands erect, or is whisked briskly about, straining occurs, mildly at first, but with increasing energy, the evacuations (if any) are scanty and hard, and there is constant anxious looking round at the flanks.

Relief may be afforded by administering an enema consisting of half a pint of soap and water at a temperature of 100 degrees Fahr. An ordinary rubber ball enema syringe is the handiest thing for the purpose, the nozzle being freely smeared with oil or vaseline before insertion. Failing a successful result, the addition of two teaspoonfuls of glycerine to a similar enema will afford relief in most cases. If this proves ineffective, a small wineglassful of castor oil may be given in warm milk.

Attention may be directed at this point to the quality of the castor oil used, for there are two distinct varieties on the market. One is a cheap, low-class oil, obtained from East India, and sold in 4-gallon tins, which is largely used on farms for lubricating axles and so forth. Because it is handy, it is often used for domestic stock, but it creates pain, and often sickness, and while a free action of the bowels results, the pain and other disturbing effects on the system indicate that it is quite unsuitable for medicinal purposes. The proper oil is the Italian cold-drawn castor oil, for which a higher price is naturally charged. This is almost tasteless, much more effective, and acts painlessly. A milder form of purgative is pure raw linseed oil, of which a wineglassful is sufficient for an average dose.

On or about the ninth day a check is usually noticed in the condition of the foal, which may manifest unusual laxity of the bowels, or present a sickly appearance. At the same time, it will be noticed that the mother is showing symptoms of œstrum, or sexual heat, and the disturbance in the foal can be attributed to the consequent change in the milk, which may last for a few days, but will subside naturally.

Constant attention, directed by common-sense, is necessary to ensure full vigorous growth in the foal, and robust health in the mare. In a clean, well-grassed paddock, in which clover or trefoil is growing, the flow of milk will be well maintained; but should there be any tendency for either to fall off in appearance, then more stimulating fodder should be provided. No better

green food can be given than lucerne, though paspalum dilatatum is also well suited for milk production in mares as well as cows.

Young mares with their first foal at times fail to give a sufficient flow, owing to lack of functional development. In other cases a foal is born prematurely, before the udder has commenced the production of either colostrum or milk, or a mare may die in the act of foaling, or shortly afterwards.

Where the foal thus misses the natural stimulus of the first flow of milk (the colostrum), the difficulties of rearing it are greatly increased, and if the foal be valuable, and worth the expense, the safest course is to secure a foster-mother. The practical possibility of this course is remote, however, and a recently-calved cow will afford some relief, although much necessarily depends on the stage at which the milk is taken, its freshness, and its warmth.

Failing any form of natural nourishment, the task has to be faced of rearing the foal artificially, or, as it is called, "poddying" it. Success in this mainly depends on the assiduity and attention bestowed by the person entrusted with the duty. Cleanliness, regularity in feeding, sympathy, and patience are needed, and these are generally found when a boy or girl becomes sufficiently interested in the animal. While the milk of the cow is suitable as a substitute for that of the mare, it requires to be modified in order to correct the inequalities of the food nutrients. To this end it is interesting to note the following table, as showing the result of approximate analyses:—

	Cow's Milk.	Mare's Milk.
Water	87·3 per cent.	88·0 per cent.
Fat	3·8 ,,	1·0 ,,
Curd (casein and albumen) ...	3·45 ,,	1·6 ,,
Milk-sugar (lactose)	4·7 ,,	8·9 ,,
Ash	0·75 ,,	0·5 ,,
	100·00	100·00

The proportion of fat, acid, and curd in cow's milk is largely in excess of those in that of the mare, while the milk-sugar is largely in excess in the case of the latter. To meet this diversity in composition, the following formula, which has met with success in careful hands, may be adopted:—

½ gallon cow's milk,
½ gallon pure rain water (or water that has been boiled and allowed to cool),
6 oz. milk-sugar, or lactose.

Mix the cow's milk and rain-water, and then add the milk-sugar. This last ingredient, which is obtainable from any pharmacist at 1s. 6d. per lb., is not so sweet as cane sugar, but it is more acceptable to a weak or delicate stomach, and more easily assimiliated.

Observation leads one to assume that a foal, under natural conditions, takes nourishment from the mother about once in every two hours, and in artificial feeding the attendant should follow nature's example, remembering also, that the food must be at the body temperature, about 100 degrees Fahr.

An ordinary feeding bottle, with no tube, and only a rubber teat affixed to the end of the bottle, may be used, after both have been subjected to a thorough cleansing in a half per cent. boiling solution of ordinary washing soda, followed by immersion in clean cold water. About a pint of the modified milk should be given each time.

The first trouble is to get the foal to suck naturally and freely, and to induce the habit the finger must be moistened with milk and passed between the lips on to the tongue. Gentleness and persuasion are necessary in arousing the instinct to suckle, and the feeding bottle and teat cannot be introduced until some success has been first obtained with the finger, but a little patience and a dose every fifteen minutes will soon get the animal to take to the bottle. When that is achieved, the flow of milk must be carefully checked, so that there shall be no disturbance in the natural act of swallowing. Later on, the bucket system may be introduced by placing the milk in a pail or small vessel, dipping the foal's nose into it, and plunging the hand in the bucket and inserting a finger between the lips. This more handy way of taking nourishment is soon learned, and the bottle can then be abandoned.

Week by week the milk diet can be strengthened by lessening the quantity of added water, and in three or four weeks pure cows' milk can be given, the addition of the sugar of milk, however, being continued.

The question of running more than one mare with foal at foot in a paddock depends simply on the temper of the mare and the convenience of the owner, but where it is necessary, as in the case of small farms, a watchful eye has to be kept on them to ensure comfort and quiet grazing conditions for all. Foals certainly improve better in company with other foals, for they enjoy the exercise attached to the scampering about that companionship engenders, but an over-jealous mare with a cantankerous disposition and an inclination to punish other foals, may disturb all the rest of the mares, and she must either be removed to another paddock or subdued by extra attention. Her quarrelsome nature may develop into biting, kicking, or other evidences of greed and temper which will arouse the maternal fighting instinct in the other mares. It is self-evident that a mare which has under such circumstances to be removed to a separate paddock should not be further used for breeding purposes if it can be avoided.

Daily contact with the mares, and study of their usefulness, temper, and disposition, enables the farmer to sum up the commercial possibilities and values of his stock for the annual replacement of worn-out animals or failures. It is a sort of valuation of his horses, regarded as working plant, and their capacity to maintain or improve the standard of the farm stock in this respect, and it is a very necessary and important calculation.

In studying the conditions of the daily life of the mare and foal, the subjects of bran mash, and of the uses of bran, present themselves for discussion, for if it is to be used medicinally it must be used in one form; while if only as an ordinary article of diet, it should be presented in another.

Bran fed in a dry state is regarded solely as a food, and it is given in order that full benefit may be secured of its high protein content. In this form it is valuable, because it stimulates the growth of red flesh, muscle, and tendon, and also a good flow of milk. It is fed with chaff, maize, hay, or other foods, and is masticated in the mouth and saturated with saliva, the process of digestion and assimilation being thus early inaugurated.

In the wet form, bran is distinctly laxative in its action on the bowels. The preparation of a mash suitable for this purpose is thus described by Captain Hayes:—

> Scald a bucket, throw out the hot water, put in 3 lb. weight of bran and 1 oz. of table salt; add 2½ pints of boiling water, stir well up; cover the bucket and allow the mash to stand for 15 or 20 minutes, until it is well cooked.

In this condition the mare swallows the bran without mastication, and it passes through the system in a semi-digested condition very quickly—so much so, in fact, that the evening mash may be detected in the next morning's evacuations, and further observed by the unpleasant flatus or gas which accompanies the fæcal discharges. This is due to the undigested flakes of bran exerting an unfavourable influence on the fermentative processes, and creating an irritant action on the intestinal mucous surfaces, which results in the relief of constipation. The bran mash is a comforting and simple remedy for constipation, provided it is not given more than once or twice a week; but if the administration is made too frequently, the system begins to tolerate and digest the bran, and its laxative influence disappears.

In many cases, where the mare is required for farm purposes, a month's rest is deemed sufficient after foaling before she is put to work again, the foal being allowed to remain handy so that he can secure a drink at convenient intervals.

The usual time for weaning is at 5 to 6 months old, and if the mare be in foal it is not wise to permit nursing any longer. Before weaning, the foal has followed the example of his mother in picking up nourishment by grazing and by taking a share of the contents of the feeding bin. Crushed oats are a dainty and enticing class of food with which to induce foals to begin to supplement the mare's milk supply. Some attention must be devoted to this last at this time. Examination of the udder will in most cases show that the drying-off is taking place in a natural manner; but in odd instances the flow is above the normal, and relief must be given by hand-milking until she dries off.

The foals should be run together in a warm, well-grassed paddock, which has ample shelter and a good water supply. Having had access to the dams' daily feed before weaning, the foals have become fitted to discard the milk diet in favour of oats, maize, chaff, or grass, but it is wise to take precautions against any check in their growth, and they should have a liberal allowance of feed during their first winter. For the first few days after weaning, the foals are restless, and somewhat rampant, but they soon become

accustomed to the absence of the dams and the change of diet. In the case of draught foals, fresh grass should be supplemented with a simple diet of wholesome wheaten chaff, but the character of the grazing should also be scrutinised to make sure that it is sufficiently succulent and nourishing, for dry, bare pasture is apt to encourage worms, and if the foals become affected that way they get checked in growth. The feet, also, should be examined, and any irregulatrity checked before the fetlocks become abnormal.

Before being turned out, the foal should be handled to quieten him, and the first approach must be gently accomplished. The head and neck should be patted firmly and smoothly until there is no flinching, and the ears may be rubbed for some time to secure confidence. Then a head-stall may be quietly slipped on. If the foal exhibits a sulky temper, patient and intelligent coaxing, with judicious periods of waiting between will have a soothing effect, and will presently inspire confidence. Should the stubbornness continue, tie the animal to a strong post for half a day, or even longer, and in most instances he will be tractable enough the next day, but it may be necessary to repeat it.

Throughout the period of handling, which should last for two or three days' running, patience, gentleness, and sympathy must predominate, and when the foal has been thus disciplined by firm but kindly means, and taught to respect the trainer, he may be turned out into the paddock with the others.

Trial of "Safonia" Spray at Yanco.

A sample of "Safonia" spray was received from the manufacturers and forwarded to the Yanco Experiment Farm for trial as a destroyer of aphis, caterpillars, etc. Two applications were made with a bucket spray-pump on 5th and 18th June, 1913, on a row of mixed cabbages and a row of Early London cauliflowers. The rows were about 40 yards long, and at the first application 3 gallons of the mixture were used at the rate of a pint of "Safonia" to 4 gallons of water, and at the second application 6 gallons were used.

The plants were thoroughly sprayed top and bottom, and as a result all aphis on the plants were killed, even though some of the plants were rather badly infested.

Shepherd's Purse.

Capsella Bursa-pastoris (L.), Mnch.

THIS weed is of European origin, and has spread in cultivated places over a greater portion of the temperate and warmer portions of the earth. In addition to the fact that it taints both milk and butter, and also impoverishes the ground, we have now an instance of it causing the death of two horses. It is quite possible that similar losses have occurred elsewhere without a close examination of the circumstances.

Recently Mr. E. J. Rogers, of Glendon, Delungra, wrote to the Department as follows :—

Under separate cover I am forwarding a ball taken from a horse that has died, and also a specimen of the weed which I believe has killed him. I shall be grateful if you will kindly have it analysed, and inform me, for future guidance : (1) if the weed is identical with that found in the horse's bowels and stomach ; (2) did it cause the death ; and if so, is it poisonous ?

I turned about 40 head of cattle and horses into a cultivation paddock where there was growing black oats, variegated or Scotch thistle, and the weed sent herewith. After the stock had been in the paddock for six days, some of the horses became sick and scoured. Those that scoured soon recovered after being removed from the paddock. Two young horses, however (3 and 2 years old respectively), which did not scour, soon started to show signs of colic and became bloated. I applied the usual remedies for colic, but after lingering for three days they died. On opening them I found that the stomach and bowels contained the material I am sending, which was found in the bowel about 5 feet from the outward passage, and was exactly in the same place in both horses.

The thistles and black oats were in a state of very young growth, and the weed sent was just in seed and showed signs of ripening.

I may further mention that more of the horses passed lumps of material like the one forwarded, but showed no signs of colic. The cattle were not affected in any way.

The weed and ball were submitted to the Chemist's Branch, and Mr. Guthrie reported as follows :—

The ball material on arrival weighed 1 lb. 9½ oz., and on analysis gave the following results :—

Moisture at 100° C.	10·36 per cent.
Crude fibre	29·72 ,,

No alkaloid or other substances likely to act as a poison could be detected in this ball.

The weed was *Capsella Bursa-pastoris* (Shepherd's Purse), and on analysis gave the following :—

Moisture at 100° C.	14·39 per cent.
Crude fibre	26·15 ,,

Nothing likely to be poisonous to stock could be discovered in the plant.

The fibre-ball contains fibres from Shepherd's Purse in large quantity, approximately 50 per cent.

The analysis shows the plant to contain a high percentage of indigestible fibre, and if eaten by stock, likely to cause the compacted ball of fibre submitted.

These particulars were forwarded to the Stock Branch for comment, and the Veterinary Officers of that Branch state :—

Such balls will frequently cause death by simple mechanical obstruction of the bowel.

Owing to the anatomical arrangement of the stomachs in cattle they are enabled to digest an amount of fibre which would kill horses, hence their freedom from trouble.

As a matter of practice it has been found that giving horses, pasturing on such weeds from necessity, a feed of chaff once a day, has a great influence in preventing deaths.

The only treatment to remove such balls is frequent small doses of oil and turpentine, with copious enemas two or three times daily.

Although this plant is only an annual, still in favourable seasons two or three crops will often mature, especially in the coastal districts. When the plant is left to grow at its own sweet will, it produces a great amount of seed, which will readily grow after showery weather at almost any season of the year, so that in time it becomes almost irrepressible. In high-class cultivation it may be kept in check by the persistent use of the hoe or scarifier. On pasture land, however, it is a rather difficult matter to get rid of it once it gets fairly well established. As already stated, it not only impoverishes the ground, but milking cows are fond of browsing on it, and being possessed of a pungent flavour it taints both milk and butter, often so strongly that it is spoilt for domestic use. Where it is abundant on grass land it will be advisable to keep the plant cut down with a mowing machine or scythe, to prevent it from seeding and spreading to adjoining paddocks. It is only by concerted action that these weeds can be kept in check.

To enable readers to recognise it, we reproduce the plate published in the *Agricultural Gazette*, vol. II, page 29.

Reference to plate.—A, is an open flower showing arrangement of calyx, petals, stamens and pistil. B, the pods with the valves open, showing the seeds as arranged on the septum. C, showing the arrangement of the stamens round the ovary. D, a petal. All variously magnified.

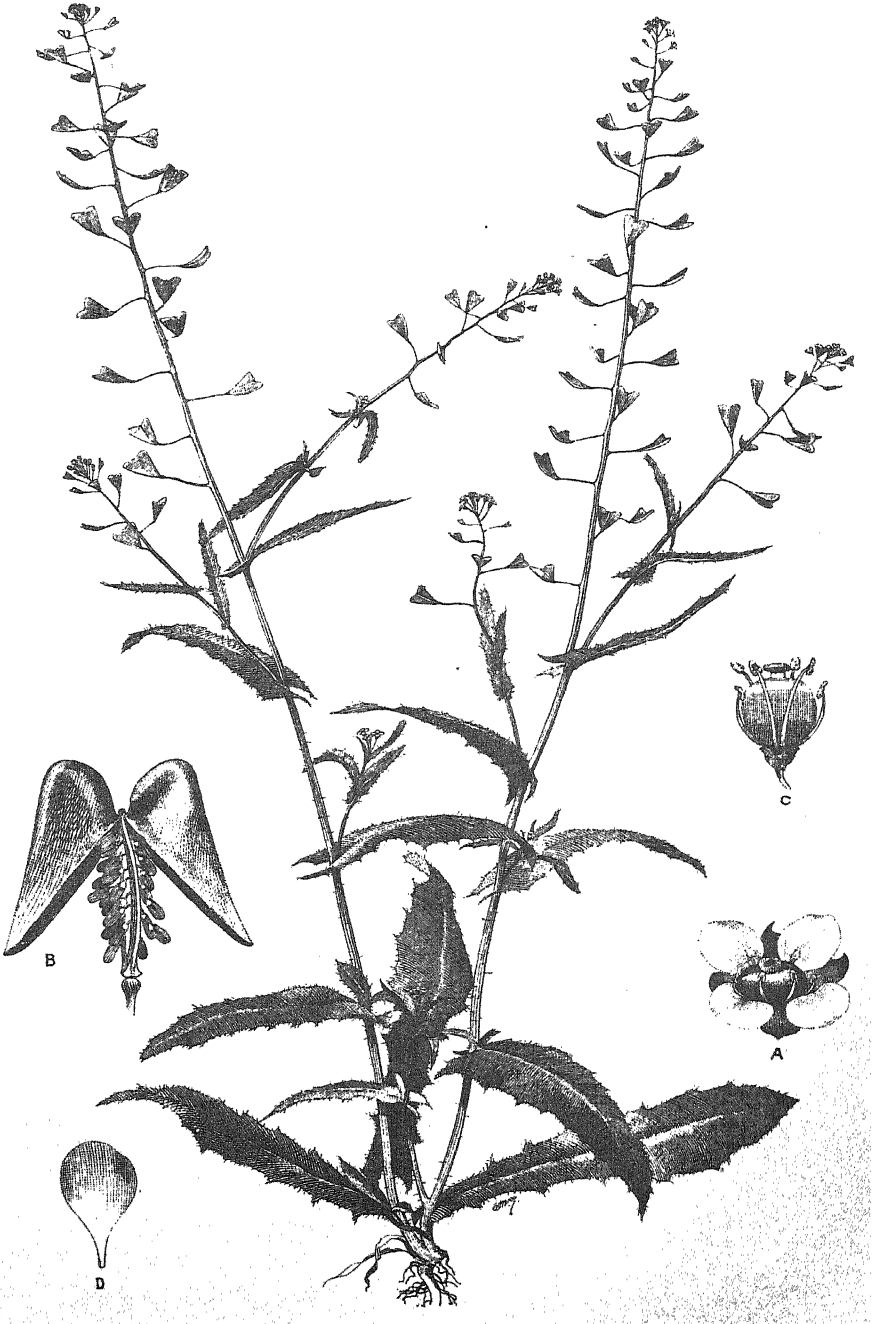
Waterproofing Tarpaulins.

Several correspondents have asked us to furnish them with a suitable recipe for rendering tarpaulins thoroughly waterproof. By the courtesy of the Chief Commissioner for Railways, we are enabled to publish the treatment given to tarpaulins by that Department. They are made from No. 5 canvas, 48 inches wide, and weighing 20 oz. per square yard. The tarpaulins are dressed with two coats of the following mixture:—

Boiled oil	60 per cent.
Raw oil	31 „
Fish oil	9 „

A correspondent asks whether, in making pit ensilage of variegated thistles which have been cut with a reaper and binder, it would be necessary to cut the binder twine in order to distribute the load. The writer considered that the cost of handling thistles could be reduced very considerably by the use of a binder; but he hesitated to adopt that method of cutting until he was sure that the sheaves would pack close enough to exclude the air.

In reply, the Acting Under-Secretary and Director of Agriculture stated that the best results are usually obtained by cutting the twine when stacking, as the material then packs more closely and thus excludes the air.



Capsella Bursa-pastoris (L.) Mnch.
(Shepherd's Purse.)

The Production of Charcoal.

R. D. HAY, Director of Forests.

THIS question has been for some time past before this Department, as it is recognised as one of the practical methods for utilising waste forest products, and in a paper read before the recent Conference of Forestry Heads in Victoria, November, 1912, on the economization of wood material, the following reference is made to it:—

Charcoal.—The manufacture of charcoal is the direction in which much of the forest waste could be most conveniently utilised, and the introduction of the suction gas-engine, which is designed to develop power by utilizing the gas generated from heated charcoal, is likely to enormously stimulate and increase the demand for that commodity. At present charcoal is not largely produced by kiln-burning owing to the cost of labour involved in handling wood and making kilns, the time occupied in its burning and the comparatively low value of the commodity when produced. With greater demand the price will, no doubt, increase, and it is possible that the problem of economizing waste wood will be largely solved by an increased demand for charcoal. Already experiment is being made to provide for that demand by new methods of burning, and a specially constructed clay-lined iron cylinder has been patented for the purpose, and under trial is claimed to have given very satisfactory results in the quantity and quality of charcoal so produced.

It may be mentioned that a trial of the merits of this patent retort has been made under Government supervision, and the following is an extract from the report of the supervising engineer:—

The retorts were not in operation at the time of my visit, the lessee being dissatisfied with the price he was obtaining from the company. He informed me that the retorts held 5 tons of wood, and that the burning of the charge took from eighteen to twenty-four hours, resulting in 25 cwt. of charcoal, and that he had found the spotted gum and ironbark gave the heaviest weight, but the oak the best quality. With the four retorts he and another man working intermittently for a period of three months had shipped 730 bags of charcoal, giving approximately 40 bags to the ton. He informed me that he did not intend proceeding further with the work by retorts, and I was informed that on the opposite side of the river it was proposed to start burning pit charcoal, which would lead to the view that the retorts had not proved to the practical charcoal burner that they are more economical than the old method of burning in *meiler* or mounds.

It is possible that the patent retort referred to has not yet proved to be the most practical or economical method of producing charcoal, but that subsequent improvements to it may offer a better solution of the question, meanwhile it might be advisable to collect and collate the latest available information on existing methods.

The following questions are worthy of consideration, and replies are invited from persons in any way interested in the industry.

(1) Can you furnish information bearing on any method practised for the production of charcoal, which differs from the ordinary surface kiln process?

(2) What are the best kinds of indigenous woods for production of charcoal?

(3) Is it preferable to utilise green or dead wood?

(4) In the kiln process—

(*a*) What is the most economical method of construction?

(*b*) In what sizes should the timber be cut, and how should it be stacked?

(*c*) What is the best method of covering it?

(*d*) What is the average time occupied in burning?

(*e*) What is the average cost of production per cwt., and the average sale value when produced?

The Origin of Ostrich Farming in South Africa.

Ostrich-farming was begun by the catching of wild birds some time between the years 1857-60. As far as can be gathered the two men who are entitled to be called the fathers of the ostrich industry are Messrs. Van der Westhuyzon and Gert Oliver. They caught many wild birds which were then running on the flats, domesticated them, and bred from them. The feathers of these wild birds and their progeny were in great demand, and from £20 to £30 was paid for the full plumage of a single bird. At the market at Oudtshoorn £20 apiece has been given for the plumes of twenty-two birds. Nowadays, for far finer feathers, £6 is a fair average price. Some twenty-five years ago (1886-88) there was a bad slump in the price of feathers, which then realised only from £2 10s. to £3 per plucking. At that time there seemed to be no demand for feathers.

The credit of first introducing lucerne to Oudtshoorn is due to a former magistrate, Mr. Scholtz. He sowed a small patch in drills in his garden. A little later Richard Gavin arrived from Ireland. He noticed this leguminous plant, and thought it very like the clover of his old home. Accordingly he asked a firm of seed merchants, at Capetown, to procure some seed for him. This he sowed broadcast on a piece of land which is now a part of High-street, Oudtshoorn, and there it grew luxuriantly.

One of the first farms on which lucerne was planted on a large scale was Welbedacht ("well thought of"), which was owned by the Gavin Brothers. They were probably the first farmers in South Africa to realise that lucerne fodder could be used not only to feed ostriches, but also for all kinds of live stock as well. Before their experiments it was practically unknown in this country. Since then every year more and more land has been laid down to lucerne. Six birds to the morgen can be kept on irrigated lucerne land, and we can safely reckon on an average price of £8 to £9 for the plumage of good birds. The annual output of feathers from Oudtshoorn is now close on a million sterling.—*Agricultural Journal of the Union of South Africa.*

Analyses of New South Wales Wines.

[Continued from page 346.]

F. B. GUTHRIE AND A. L. MUSSO.

SERIES V.

FROM the details of the analyses of wines from a Riverina winegrower, which are given in the annexed table, it will be seen that from their composition, as well as from their physical characters, these wines can be classed among the full-bodied wines which are typical of the Riverina district. The high percentage of extract, as well as of ash, characterises them as rich wines, and this appears more evident in the case of the 1913 samples.

The volatile acidity is, on an average, rather low—quite low in the young samples. It is somewhat high in the five years old Burgundy, but it cannot be considered excessive. The sweet red is a palatable wine, though the high sugar content may not appeal to all tastes. If these samples can be taken as representative of the product of the Riverina district, there is no reason to be surprised that there is a good demand for such wines.

SERIES VI.

From the results of the following analyses, as well as from their palatable characters, these wines, all of which except the last one are of the dry type, appear in good condition and well fermented.

In the Clarets (No. 4 to No. 9) it is noticeable that the proportion of tannin is higher than is usual in similar wines of local production.

Sample No. 10 is a good sweet wine, with an especially pleasant aroma.

The volatile acidity of all these wines is rather low.

The high proportion of ash in all the red wines is worth noticing. It reaches almost four parts per thousand in the Verdot, and it is higher still in the wine from Cabernet grapes (·435).

As was pointed out on another occasion, this high amount of mineral matters increases the dietetic value of these wines.

The wines are a product of a County Cumberland vineyard.

SERIES VII.

The wines to which the attached analyses refer come from the same cellar as those first analysed by this branch, and whose results were published in the *Gazette,* January, 1913, Table I, Series I.

As can be seen by the figures, there is a great improvement in the quality of these wines, as indicated by their volatile acidity, which is lower than in the previous wines, and also by the fact that they do not contain any mannite. This shows that more care was exercised during the fermenting period, consequent on the warning given to the winegrower.

On the whole the wines appear to be in good condition and capable of developing under proper care into good products. The amount of ash in these wines does not appear so high as in the generality of the wines of this State, with the exception of Sample 1913 G. In one case, 1913 H, the amount of ash is exceptionally low. This fact, which may be due to different causes, calls for the attention of the winegrower.

TABLE V.—ANALYSES OF NEW SOUTH WALES WINES.—SERIES V.

Name of Wine.	Specific Gravity at 15·5° C.	Absolute Alcohol by volume per cent.	Percentage of Proof Spirit.	Total Acids as Tartaric.	Fixed Acids as Tartaric.	Volatile Acids as Acetic.	Extract.	Ash.	Sugar.	Potash as Bitartrate.	Total Tartaric Acid.	Tartaric Acid free.
Burgundy, five years old ...	0·9896	18·88	33·08	0·61	0·45	0·12	3·26	0·298	0·25	0·065	0·115	0·063
Sweet Red, two years old ...	1·0872	19·08	33·44	0·49	0·37	0·10	26·04	0·227	23·53	0·095	0·094	0·018
Dry White	0·9887	15·68	27·48	0·43	0·37	0·045	2·37	0·207	Nil.	0·194	0·207	0·070
Malbec Dry, 1913	0·9937	14·18	24·85	0·64	0·58	0·05	3·23	0·332	0·125	0·270	0·265	0·05
Shiraz, 1913	0·9919	16·70	29·27	0·59	0·53	0·05	3·30	0·320	0·166	0·247	0·244	0·05

TABLE VI.—ANALYSES OF NEW SOUTH WALES WINES.—SERIES VI.

Name of Wine.	Specific Gravity at 15·5° C.	Absolute Alcohol by volume per cent.	Percentage of Proof Spirit.	Total Acids as Tartaric.	Fixed Acids as Tartaric.	Volatile Acids as Acetic.	Extract.	Ash.	Sugar.	Tannin.	Total Tartaric Acid.	Potash as Bitartrate.	Tartaric Acid, free.
1—1913. White Shiraz	0·9925	13·15	23·04	0·6	0·51	0·075	2·17	0·275	0·36	0·019	0·292	0·253	0·097
2—1913. White Shiraz, Jubilee ...	0·9935	12·13	21·27	0·8	0·71	0·073	2·35	0·229	0·125	0·009	0·322	0·306	0·077
3—1913. Riesling	0·9955	14·09	24·69	0·49	0·37	0·066	3·12	0·216	1·23	0·006	0 292	0·294	0·065
4—1913A. Hermitage, Cask No. 31 ...	0·9959	12·49	21·89	0·50	0·42	0·063	2·84	0·363	nil	0·191	0·262	0·294	0·027
5—1913B. Hermitage, Cask No. 3 ...	0·9963	12·40	21·73	0·57	0·49	0·060	3·01	0·369	nil	0·191	0·274	0·287	0·045
6—1913C. Hermitage, Cask No. 40 ...	0·9961	12·68	22·22	0·60	0·52	0·06	3·04	0·361	nil	0·153	0·232	0·256	0·027
7—1913. Cabernet, Cask No. 33 . .	0 9982	12 05	21·11	0·53	0·45	0·063	3·34	0·435	nil	0·202	0·256	0·249	0·057
8—1913. Italian Grape—Black Spanish —Hermitage, Cask No. 23	0·9956	12·68	22·22	0·49	0·39	0·077	2·93	0·383	nil	0·171	0·172	0·121	0 075
9—1913. Verdot, Cask No. 11	0·9980	11·08	19·42	0·61	0·52	0·07	2·96	0·395	nil	0·165	0·278	0·249	0·080
10—Aleatico...	1·0265	17·37	30·45	0·38	0 31	0·055	12·35	0·303	9·26	0·081	0·171	0·102	0·100*

* Fortified,

TABLE VII.—ANALYSES OF NEW SOUTH WALES WINES.—SERIES VII.

Distinguishing Marks.	Specific Gravity at 15·5°C.	Alcohol absolute per cent. by volume.	Percentage of Proof Spirit.	Total Acids as Tartaric.	Fixed Acids as Tartaric.	Volatile Acids as Acetic.	Extract.	Ash.	Sugar.	Tannin.	Potash as Bitartrate.	Total Tartaric Acid.	Tartaric Acid, free.
1—1912—P	0·9858	18·98	33·26	0·58	0·45	0·105	2·34	0·155	0·10	Nil.	0·052	0·190	0·148
2—1913—A	0·9887	16·70	29·27	0·67	0·57	0·080	3·36	0·133	0·76	0·005	0·227	0·370	0·189
3—1913—D	0·9870	18·48	32·38	0·56	0·47	0·080	2·44	0·183	0·14	0·004	0·133	0 217	0·111
4—1913—H	0·9901	16·43	28·78	0·66	0·56	0·075	2·71	0·189	0·19	0·006	0·234	0·301	0·114
5—1913—M	0·9890	16·52	28·95	0·54	0·43	0·090	2·65	0·195	Nil.	0·007	0·185	0·229	0·080
6—1913—N	0·9904	15·86	27·81	0·70	0·59	0·086	3·16	0·180	0·44	0·009	0·223	0·283	0·090
7—1913—O	0·9879	18·88	33 08	0·58	0·47	0·086	2·81	0·184	0·21	0·004	0·136	0·196	0·087
8—1913—P	1·0005	14·65	25·67	0·78	0·57	0·176	4·90	0·187	1·43	0·011	0·205	0·259	0·094
9—1913—G	0·9970	16·98	29·76	0·58	0·50	0·066	4·68	0·245	1·25	0·076	0·095	0·181	0·104
10—1913—J white	0·9921	16·33	28·62	0·70	0·62	0·068	3·36	0·187	0·50	0·007	0·181	0·241	0·096

Trials of Imported Squashes.

By the courtesy of the Bureau of Agriculture at Manila, Philippine Islands, the Department received packets of seeds of various kinds. These included three varieties of squash, named Condol, Native Squash No. 290, and Native Squash No. 300. These were forwarded to the Hawkesbury Agricultural College and the Grafton Experiment Farm for trial.

At the College four holes of each of the squashes were sown in a bed of one acre of marrows, squashes, and gourds, but none of the trial seeds germinated, whereas germination throughout the rest of the block was very good.

At Grafton the results were somewhat more successful. Sowing took place on 20th December, 1912, in hills 15 feet apart each way. The seeds appeared to be of low vitality, and only a few hills were sown, as follows:—

Condol.—Four hills of five seeds each.
Native Squash No. 290.—Two hills of six seeds each.
Native Squash No. 300.—One hill of six seeds.

No manure was applied.

Germination was very unsatisfactory. Only one seed of Native No. 300, one in each hill of Native No. 290, and in three hills of Condol one only came up in each. These were attacked by the Banded Pumpkin Beetle (*Aulocophora oliverei*), but eventually became firmly established and able to withstand the attack.

The season was a good one, 25 inches of rain falling between sowing and maturity, and the plants grew continuously. The runners were numerous, and were exceptionally long, averaging well over 30 feet, and odd ones reaching 35 feet. They were not pinched back.

Harvesting took place on 26th July. The three varieties were even in ripeness, taking approximately seven months to reach full maturity.

The one vine of Native Squash No. 300 gave 453 lb., the two of Native No. 290 yielded a total of 240 lb., while the three vines of Condol yielded 727 lb., one of these producing 367 lb. It is, of course, unwise to calculate these yields upon an acreage basis, owing to the smallness of the number of plants, but it is evident that they all possess valuable qualities, and are worthy of further trial.

Description.

Mr. Kerle, Experimentalist at Grafton Farm, describes the three varieties as follows:—

Native Squash No. 300.—This is an exceptionally fine squash, regular in shape, size, and colour. It is spherical in shape, with flattened ends, and has

numerous vertical corrugations around its circumference. It is perfectly smooth and clean in the skin, which is of medium thickness. From the one vine of this variety thirty-three squashes were harvested, the average weight being 14 lb., and dimensions 12 inches in diameter by 6 inches in thickness. The flesh is finely grained, solid, and light-yellow in colour. The seed cavity is comparatively small, the flesh being 2 to 2½ inches in thickness. For table purposes it is excellent, having a pleasant, faintly sweet, mild flavour. It presents a soft appearance when boiled. This squash should be a good keeper, one noticeable feature being the strength of the stalk, which, unlike many varieties of the cucurbitaceous family, is not easily knocked off, and is thus able to withstand comparatively rough handling.

Native Squash No. 290.—This is a round, elongated variety, with slight longitudinal corrugations. It is variable in size, ranging from 16 inches long by 9 inches diameter to 12 inches long by 6 inches diameter. The average weight was 13 lb., single ones weighing as much as 22 lb. As regards colour, character of skin, texture and amount of flesh, firmness of stalk, and suitability for the table, it is very similar to Native Squash No. 300. Its chief disqualification is that it is a comparatively shy bearer. It contains very few seeds, and very few, if any of them, are fertile.

Condol.—This variety is very variable in size, shape, and productiveness. The best vine yielded 367 lb., and the other two averaged only 180 lb. for no apparent reason. The size varied from 10 inches in diameter by 10 inches in thickness to 16 inches in diameter by 12 inches in thickness. The average weight was about 15 lb., but two on the best vine averaged 43 lb. each, and another on the same vine weighed 30 lb. The majority were pear-shaped, but some were flattened on the top. In colour, markings, texture, and culinary value, it is similar to the other two.

Conclusions.

Sufficient has been said to show the value of the three varieties, and more extended trials will be made next season at the Hawkesbury College and the Grafton Experiment Farm.

It should be noted that no seed will be available for distribution this year, but every effort will be made to ensure a sufficient supply in future.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

Branch.	Honorary Secretary.
Albury	Mr. J. D. Lankester, Albury.
Baan Baa	Mr. P. Gilbert, Baan Baa.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Batlow	Mr. A. C. Arnot, Batlow.
Beckom	Mr. S. Stinson, Beckom.
Bonville	Mr. H. B. Faviell, Bonville.
Borambil	Mr. H. A. D. Crossman, "Homewood," Quirindi.
Bungalong	Mr. E. Hughes, Oakleigh, Cowra Road, *vid* Cowra.
Cardiff	Mr. F. B. Cherry, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Collie	Mr. C. J. Rowcliff.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coradgery	Mr. G. C. Harris, Wallandra, Parkes.
Coreen-Burraja	Mr. Wm. Stodart, Coreen, *vid* Corowa.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Deniliquin	Mr. W. J. Adams, jun., Deniliquin.
Derrain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Erudgere	Mr. Frank Hughes, Erudgere.
Fernbrook	Mr. W. Marks, Yarrum Creek, Dorrigo.
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. W. Smith, Henty.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Jindabyne	Mr. Sylvester Kennedy, Jindabyne.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit, *vid* Manilla.
Kellyville	Mr. C. F. Boughton, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S. Stening, Little Plain, *vid* Inverell.
Lower Portland	Mr. W. C. Gambrill, Lower Portland.
Mangrove Mountain ...	Mr. G. T. Hunt, Mangrove Mountain, *vid* Gosford.
Middle Dural	Mr. H. Porter, Middle Dural.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Moruya	Mr. P. Flynn, Moruya.
Narrandera	Mr. C. F. Pearce, Narrandera.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
New Italy	Mr. F. A. Morandini, New Italy.
Nimbin	Mr. J. H. Hutchinson, Nimbin.
Orangeville	Mr. C. Duck, Orangeville.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *vid* Penrith.
Parkesbourne	Mr. W. H. Weatherstone, Parkesbourne.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose-Kareela	Mr. L. Pieremont, "Vila," Penrose.
Redbank	Mr. J. A. Graham, Woodlands, McAlister, *vid* Goulburn.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria Streets, St. Mary's.
Sackville	Mr. C. H. Britten, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Stockinbingal	Mr. J. Neville, Stockinbingal.

Branch.	Honorary Secretary.
St. John's Park	Mr. A. King, St. John's Park.
Tallawang	Mr. J. E. Hansall, Tallawang.
Taralga	Mr. Dave Mullaney, Stonequarry, Taralga.
Tenterfield...	Mr. R. Livingstone, Tumbarumba.
Toronto	Mr. J. G. Desreaux, Esmond, Toronto.
Tumbarumba	Mr. R. Livingstone, Tumbarumba.
Upper Belmore	Mr. J. E. Garred, Upper Belmore.
Uralla	Mr. E. A. Neil, Uralla.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Wyong	Mr. Edgar J. Johns, Wyong.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Demonstrations in Clearing Land and Subsoiling with Explosives.

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. H. C. Coggins, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Bee-keeping.

A series of lectures on bee-keeping is being arranged by Mr. R. G. Warry, Demonstrator in Apiculture. Secretaries, whose branches intend availing themselves of this opportunity to receive a practical insight into this branch of agriculture, are requested to make early application.

Veterinary Lectures.

In connection with the lectures to branches of the Agricultural Bureau, it is herewith pointed out for the information of honorary secretaries that the following is the list of subjects of lectures which can be delivered to them :—

Horses.—(1). Conformation and Unsoundness (with lantern illustrations); (2) Colic and Treatment of Wounds; (3) Strangles, Influenza, and Tetanus.
Cattle.—(1) Tuberculosis (with lantern illustrations); (2) Contagious Abortion and Contagious Mammitis; (3) Ticks, Tick Fever, Tick Infestation and Eradication.
Sheep.—Parasitic Diseases of Sheep.
Pigs.—Diseases of Pigs.
General.—(1) Parturition of Farm Animals (with lantern illustrations); (2) Feeding of Farm Animals and Dietetic Diseases; (3) Sterility: Causes and Treatment in all classes of Stock.

REPORTS AND NOTICES FROM BRANCHES.

Albury.

A lecture on bee-keeping was delivered by Mr. R. G. Warry on the 27th August.

THE DISCOURAGEMENT OF SWARMING BEES.

The importance of each kind of bee to the economy of the hive and to the bee-keeper was explained. In the case of the drone, it was shown that a more profitable colony was obtained when excessive drone-rearing was curtailed, and in describing comb-building the use of full sheets of comb foundation was recommended as a good means of curtailing drone-laying and producing profitable brood combs.

A short description of the egg-laying apparatus in the abdomen of the queen bee followed, with an account of her life from the egg to the complete insect. The disadvantage of swarming stocks was gone into at some length, it being pointed out that where swarming stocks were kept, the inclination to swarm was increased with every new queen the colony raised, whereas if queen bees were carefully reared from selected stock, a non-swarming line could be produced, which was always more profitable as a honey-getting strain than cross-bred queens reared without selecting the parents. The process of grafting queen cells from the young brood of a selected colony was described, and the chief points to look for when selecting a stud queen were enumerated.

In connection with the worker bee, the processes of wax-secretion from honey and comb-building were described in detail, and full sheets of comb foundation were shown to be an economy in a colony of bees—not an unnecessary extravagance, as might at first be supposed. After describing the method for detecting the disease "foul brood" in a colony of bees, and the best way to get rid of it, the lecturer showed how a small apiary could be made very profitable in the Albury district.

Batlow.

A new branch has been formed at Batlow, and the following officers elected :—Chairman, Mr. F. W. Harris; Vice-Chairman, Mr. C. Smith; Hon. Secretary and Treasurer, Mr. A. C. Arnot. The annual subscription has been fixed at 2s. 6d.

Borambil.

The monthly meeting of this branch was held on the 18th July in the local hall. A discussion took place as to which was the breed of dairy cattle best suited to the district, and it was generally agreed that the Jersey was the most suitable breed.

Mr. R. G. Warry gave a lecture on apiculture to members of the above branch, on the 22nd August.

APICULTURE.

The subject was dealt with as a subsidiary industry, and the quickest methods for obtaining and extracting the honey crop were explained in detail, the modified Bolton hive being recommended as the hive which best enables a farmer to find time for bee-keeping without interfering with his usual routine work. Manipulation of the Bolton hive was illustrated by lantern slides, and a description of the brood combs of a colony of bees at swarming time showed how the Bolton hive enables excessive swarming to be checked, and sound combs to be obtained at the same time. The necessity for a distinct breed of bee was emphasised, the energy of the bee, not its colour, being the chief consideration. Here it was pointed out that a colony producing the greatest quantity of honey need not of necessity be the colony with the greatest number of bees in it. Indiscriminate cross-breeding produced a hybrid bee, whose restlessness and viciousness were often mistaken for energy, whilst swarming was more difficult to control in an apiary of hybrid stocks than in one of pure-bred Italian stocks, or of cross-bred stocks where judgment had been used in selecting the stud queens and drones for cross-mating.

Foul brood of bees was described as an infectious disease, and the "McEvoy" or "Jones" starvation methods were recommended as the most reliable for getting rid of the disease. The destruction foul brood can cause among the colonies of bees in a district was shown to be mainly due to inattention to the apiary, and to the use of the "gin-case" or "box" hive, the latter being not only a method of spreading the disease, but an unprofitable hive to use compared with the frame hive.

Coonabarabran.

The Secretary of the above branch has forwarded his first annual report, which is very satisfactory.

The report states that the membership numbers seventy-four. Ten general and three committee meetings have been held during the year.

Demonstrations by officers of the Department of Agriculture have been given on pruning and orchard management, sheep and wool, and in the use of explosives in clearing and subsoiling.

Experiment plots were established at Yerinan, and sown with different varieties of wheat and varying quantities of manures.

Papers have also been read and discussed on "Lamb raising, combined with mixed farming," "Fungoid diseases," "The best use of corn-stalks where grain crops have failed," "Threshing *versus* stripping wheat crops," and "The best breed of sheep for the district." Other subjects discussed were "Treatment of growing wheat crops," "Maize production," "Best method of introducing improved sorts of grasses into large paddocks," "Poultry," "Silage," "The use of wire on the farm," "Stack building," and "Potato diseases and treatment."

In conclusion, the secretary states that a decided want appears to have been met, and, considering the many advantages, privileges and benefits to be derived at a nominal price, not to mention the pleasant social intercourse, it is anticipated that no farmer who is capable of recognising his own interests will in future hold aloof from the Agricultural Bureau.

Coradgery.

A branch has been formed at Coradgery. The office bearers are as follow:—President, Mr. W. E. Tayler, Adavale, Parkes; Vice-President, Mr. J. L. Whitmill, Wombin, Parkes; Hon. Treasurer, Mr. H. N. Marriott, Hubberaton, Parkes; Hon. Secretary, Mr. G. C. Harris, Wallandra, Parkes.

Deniliquin.

At the July meeting of this branch, held at Mr. R. G. Walker's residence, Pretty Point, there was a brief discussion on the poor germination of the wheat sown this season. In the majority of instances the crops are thin, and it was suggested by some farmers present that perhaps the cause lay in the fact that the same strain of seed wheat had been sown year after year without obtaining a change of seed from a different district. However, it was shown that this could not be the reason, as farmers who are continually getting new seed from different localities were experiencing the same trouble.

DEPARTMENTAL NOTE.—In connection with the above, Mr. H. Ross, Chief Inspector of Agriculture, states that this trouble is very prevalent this year right throughout the State, and while no definite reason can be assigned for it, he is inclined to the belief that the poor germination is most likely due to faulty pickling. If, for instance, wheat be pickled in a 2 per cent. bluestone solution (that is to say, in a solution containing 2 lb. of bluestone to 10 gallons of water), and then allowed to lie for, say, ten days or a fortnight before sowing, the corrosive action of the bluestone is sure to impair the vitality of the seed wheat. Farmers are therefore advised, wherever practicable, to dip the bluestoned wheat into a solution of lime-water before sowing it. The lime-water solution is made by placing 1 lb. of freshly burned unslaked lime in 10 gallons of water.

A paper was also read by the Secretary on bacon curing.

At the August meeting of the branch, the main subject for discussion was "Poultry on the Farm," and the Honorary Secretary (Mr. W. J. Adams, junior) gave a lecture on his experience in poultry-farming.

POULTRY ON THE FARM.

Mr. Adams pointed out what a valuable asset poultry is on the farm, stating that in many cases laying hens were as profitable as sheep. He considered that a hen should not lay less than twelve dozen eggs per year, and that eggs should bring an average price of 1s. per dozen. As the average price of feed should be 5s. per head per year, a net profit of 7s. per year was left.

In answer to a question as to whether a pure-bred hen of good laying strain would lay as well as a cross-bred hen, the lecturer said that to make a poultry farm profitable, hens should be pure-bred and of a good laying strain.

In answer to another question, Mr. Adams said that hens would lay better in small enclosures than if allowed to run together in a large paddock.

Fernbrook.

A new branch has been formed on the Dorrigo, to be called the Fernbrook Branch. The officers that have been elected are :—Chairman, Mr. H. R. Catte; Vice-Chairman, Mr. A. C. B. Newman; Hon. Treasurer, Mr. E. W. Newman; Hon. Secretary, Mr. W. Marks. The annual subscription has been fixed at 1s., and meetings will be held on the Wednesday before or at full moon.

Forest Creek.

Mr. H. S. Major, Assistant Sheep and Wool Expert, will be at Forest Creek on the 14th October in order to visit the various members' wool sheds, when he will classify the different grades of wool from the outset, in order to prevent any errors being made.

The annual meeting of the branch was held on Wednesday, 3rd September. The annual report showed that the branch had held eleven meetings during the year. Two

lectures and demonstrations were given by Mr. J. W. Mathews, Sheep and Wool Expert, a lecture by Mr. Stening, Inspector of Agriculture, and a paper on "Water and Fodder Conservation" by Mr. T. B. Prosser. Experimental plots had been established on Mr. J. G. Chudleigh's farm. The picnic in connection with the branch was interfered with by unfavourable weather—heavy rain in the morning of the date fixed. The finances showed a satisfactory account.

The following officers were elected for the ensuing year:—President, Mr. Thos. B. Prosser; Vice-President, Mr. J. W. Prosser; Treasurer, Mr. C. F. S. Gee; Secretary, Mr. W. Thompson.

The following paper was read by Mr. W. Thompson:—

Improvements in Dairying.

This paper has a twofold purpose: (1) That the breed of cattle used for dairy purposes in this district may be improved; and (2) that a better system of regulating the supply of milking cows may be brought about in the district.

As regards the first of these matters, I maintain that we should have "the best" within our means. It costs no more, or very little more, to keep a good beast than a bad one, and there is a much greater return. Some farmers say it does not matter where the produce—milk and butter—comes from, because in a sense they have no commercial value, there being no market for them, but I maintain that it does very much matter, in that fewer cows of a better quality would be needed for supplying the wants of home consumption. Then why should not some enterprising farmer take up the matter of butter supply to the local store?

In dealing with the matter of improving the class of cattle, the first question to be considered is the selection of a sire—an item requiring as much consideration as the selection of the cows. Here almost any nondescript bull is considered suitable for running with the cattle—one of the greatest mistakes possible, as the progeny are then useless for dairying purposes. In this locality the farmers should co-operate and buy one of the best sires procurable, and then each could have the services of the animal as he was required, and anyone outside the purchasers could be charged a service fee. Arrangements could be made for one resident to provide a proper place for keeping the bull, as he should not be allowed to run freely with the other stock. There are many reasons for this procedure, one of the most important being that the cows may be served so as to have them come in at any required time, and so keep a succession of newly calved cows throughout the year. The sire should be the best obtainable, of undoubted quality as regards his pedigree, and should come from a good milking strain.

The cows selected by each resident should also be of good quality. For my part, I prefer the Jersey strain, as they are rich milk producers, and here the butter produced is of more real consequence than a big supply of milk. Breeders have different fancies, but it would be sufficient here, if only one bull was being used, that most of the cows be of the same breed. Perhaps one or two cows of other breeds of recognised quality could be kept to test the value of cross-breeding for butter-producing qualities. During the summer, green fodder of some kind should be grown for the milking cows, and in the winter time some shelter should be provided and rugs used, as the winters are fairly severe, and it takes too much food to keep up the animal heat unless some other means of protection are employed.

To my mind the calves should be weaned. In this district this course is objected to on the ground that it is too much bother. Well, I have tried both systems, and I know that I prefer to wean the calf for several reasons: (1) because when the calf is weaned you get all the milk and especially the richest part, which otherwise is kept back by the cow; (2) it is no more bother to milk the cows in the evening than to shut up the calves, as generally when you are in a hurry putting the calves in the pen some of them—or perhaps only one—takes an interest in some far-off corner of the paddock, which means wasted time; (3) I will undertake to milk a cow and feed the calf in less time than it takes to milk the cow when the calf has to get its share of milk. The calves do almost as well, especially if some of the new milk is added to their ration of milk each feeding time.

Where three or four cows are kept for home use, I would strongly advocate the use of a small separator. These can be procured very cheaply, and by using them the milk can be treated right away after milking and the skim milk fed back to the calves. The separator improves the churning quality of the cream—the butter coming quicker and easier, especially in the summer time.

There is one very important reason why I advocate this improvement in the quality of the dairy cattle. During the past twelve months the quantity of milk sent away from the South Coast to Sydney has greatly increased, and now much of the milk produced as far down as the Shoalhaven River goes to Sydney, with the inevitable result that in the future it will be impossible for the farmers there to rear so many calves as formerly—not having the milk now to feed them. A number of dairy cattle will be required every year, and when they must go outside their own district, why should the residents here not reap some of the benefit in a good market for their young stock, in the shape of dairy heifers. Buyers would soon learn of and visit the district, if they knew they could depend upon it for the quality of the stock, and this could be brought about by using only the best sires and cows that could be procured.

Also a regular supply of cows coming in could be maintained by using the bull as I have mentioned, instead of having no milkers in the winter and too many in the summer time.

I hope the matters above referred to will receive your earnest consideration, and that some of you may put some of the ideas into practical form.

Inverell.

At the last meeting of the Inverell branch Mr. H. R. Alexander gave a lecture on dairying.

The Dairying Industry.

Mr. Alexander referred to the great strides made by the dairying industry in New South Wales in recent years. It was hard to credit that the first cream separator was introduced into New South Wales in 1885, and the first butter factory opened the same year. When he came to New South Wales in 1892, and joined the dairying business on the lower South Coast, there was nothing alluring in it then. A little cheese was made, but there were practically no butter factories. He knew people who made butter at home, and sent it to market, where it realised 3d. per lb. There was no refrigeration in use, and butter arrived on the market in a shocking condition.

Things were different now. There were factories everywhere, with the most modern equipment, while refrigerators were in general use. But he did not agree that the top standard had been reached in the industry. There was ample room for development, and they must push out. The Yanco irrigation area, for instance, was going to develop into one of the biggest dairying districts in the world, in years to come.

The first thing to be taken into consideration was the quality of the product. Their factories were equipped as well as anywhere, and the men who were managing them were capable. The blame for poor-quality butter should not be placed on the factory manager, but on the patron, and it was due to his not understanding what was wanted. He did the separating at home, and it was there that the trouble mainly occurred. The institution of the separator on the farm had its origin in New South Wales. In Victoria and New Zealand they had their skimming stations, and they were able to keep a strict watch on their cream. The home separator in New South Wales had come to stay, because of bad roads in many centres, but many farmers lacked the knowledge necessary for the proper care of cream.

He had often seen cream allowed to accumulate for six or seven days before being sent to the factory, while in many instances there was an utter want of cleanliness in regard to the separators used. These things all militated against the production of the best quality of butter. Still, with cleanliness and common-sense, a good article could be produced, even with the home separator. The cream should always be cooled. This process removed any animal taint, and preserved flavour. There need be no fear of the quality of the butter if the cream was looked after.

Next to the quality of the butter was the quantity. Two things determined quantity—good cows of the right sort and good fodder. Mr. Alexander quoted an extract from a dairying journal which stated that it was calculated that in Australia it took 174 cows to produce 4 tons of butter-fat, while in Denmark the same result was produced by 55 cows. This showed how great the need of improvement really was. The speaker also gave the result of a test conducted at an experiment farm in Illinois (U.S.A.). In this, 554 cows were

taken at random from 36 dairies. Of these, 139 of the best and a similar number of the poorest were put under test for a year, and an average was struck. The 139 best produced an average of 301 lb. for the year, while the 139 lowest gave an average of 133½. At the average price of butter in that State for five years previous to the test, the poor cows gave an average return of £6 3s. 3d. Deducting food account at the low estimate of £6, they had a clear profit of 3s. 3d. per head for the year's work and investment. The 139 best cows made an average return of £14, or after allowing an extra £1 per head for fodder, £7 per cow for the year. The profit from the poor cows was £21 10s., and from the good £900. In other words, every one of the good cows was worth forty-one of the poor ones—twenty-five would therefore be worth 1,025.

They had a long way to go yet in the matter of the quality of their cows. The Government was trying to introduce herd-testing generally. If the dairyman could exist at present, he must have a much better time with better stock. He strongly advocated herd-testing, the advantages of which were enormous. Up to the present, however, it had not been found possible to run it satisfactorily. When they remembered that they had only been dairying seriously for twenty-eight years, they would agree they had not done badly, but the stage had now been reached when the poor cows must be passed out. This would greatly add to the butter-fat production per cow, without entailing extra labour or cost. At Arrawatta they had entered some of their cattle in the Pure-bred Herd-testing Association. Later on it was intended to employ a man to conduct tests over the whole estate.

The breeds recognised out here were Shorthorn, Jersey, Ayrshire, Guernsey, and Holstein. Among these they had some cattle which would be found to suit any country and any environment. Shorthorns required fairly good country and comfortable conditions. Ayrshires were hardier and did best where they had to fossick for their food. Jerseys seemed to adapt themselves well to this district, but, compared with Ayrshires, did not show the same advantages. Until the breeds had been classified and tested, however, it would be hard to say which was best. So far the Ayrshires looked the best as regards condition. Holsteins were probably the best for cheese, but there were very few.

Mr. Alexander laid great stress on the necessity of picking out a good sire. A good sire was not necessarily a good prize-winner. Shows sometimes spoiled their ideas of cattle. One could not know a good bull until he saw and tested the sire's stock. In a district like this he would be inclined to go in for Ayrshires. He would first pick up cows as near the Ayrshire as possible and then get a good bull. He would first look at the bull's mother—see her milked, and study her constitution and appearance as well as the shape and colour of her udder and teats. If the mother were good, the sire was almost sure to get good stock. A breeder must have a fixed type in his mind to breed up to, and if the sire were good he would, as a rule, give the right type.

Mr. Alexander mentioned the peculiarity that a heavy-yielding cow rarely produced a heifer as good as herself. The heifer would be as good in quality, but not in actual results. The reason was that a cow which produced four or five gallons of milk per day was in an abnormal state. In breeding, nature would assert itself, and the heifer would be weaker in constitution. This did not hold, however, in regard to bull calves. On the average, he had found this principle to work out pretty uniformly.

QUESTIONS.—Mr. KOOK asked the speaker for his opinion on crossing of breeds.

Mr. ALEXANDER replied that he did not in any way favour crossing indiscriminately. Crossing of pure breeds, if judiciously done, would most likely give very satisfactory results. For instance, the crossing of the Ayrshire and Shorthorn made what he considered was the finest type of dairy cow in the world—the Illawarra Shorthorn. The trouble arose after the first cross, and he advised then working back to the pure stock again. On no account should a grade bull be used.

Mr. ARKINSTALL thought the productiveness of a cow depended largely on her rearing as a calf.

Mr. ALEXANDER agreed, and stated that he was particularly emphatic on the necessity for the proper feeding and care of calves. It was not a good idea

to get calves fat; it was preferable that they should be in good condition without being fat. If encouraged to put on fat when young, the tendency would probably never be lost. He advocated giving the calf beestings (the mother's first milk) for a fortnight or so, then gradually breaking it off on to skim-milk or whey, and finally on to lucerne. He believed there was sufficient in lucerne or lucerne hay to give all the nutriment the calf then needed.

Mr. LEECH advocated the Government getting an agent at Home to select utility bulls from some of the good tested herds in England. Many of these were of the highest value as milking strains, though they were not bred for show purposes.

With this suggestion Mr. ALEXANDER was in thorough accord, adding that that was exactly the idea of the Government Dairy Expert (Mr. M. A. O'Callaghan).

After a hearty vote of thanks and appreciation had been accorded Mr. Alexander for his interesting and instructive address, the meeting closed.

Katoomba.

The annual meeting of the above branch was held during August.

THE YEAR'S WORK.

The Hon. Secretary, Mr. C. Wooller, stated that the branch had completed its second year with an increased membership. Eleven meetings had been held, and three demonstrations given by experts from the Department of Agriculture. Correspondence relative to the sale of Australian fruit in London, Hull and Hamburg was sent by every mail quoting prices realised and asking for further consignments. Prices had been satisfactory, and there was an unlimited demand in the world's markets. The Bureau had been instrumental in gaining the first prize for the district competition of apples at the Sydney Royal Show, and had assisted in raising the Blue Mountains to eminence as a fruit-growing district. With the great area available for cultivation and the unrivalled climate, the Blue Mountains was destined to take a foremost place in the fruit-growing world. The thanks of the Bureau were due to the Department for its effort to assist and educate the members or, indeed, anyone who felt inclined to venture on the land.

Kellyville.

There was a good attendance of members at the August meeting of this branch, and arrangements were made for a lecture to be given by Mr. H. O. Oliver, M.R.C.V.S., Government Veterinary Surgeon, on "Conformation and Unsoundness in Horses," on the 6th October.

It is proposed to shortly hold the annual concert in the local Public School. The secretary reports that the number of members is continually increasing.

ROTATION OF CROPS.

Mr. H. BURTON, in opening a discussion on this subject, gave a very interesting address. He traced the matter from the earliest of records—from the time of Cato and Virgil, who tell of alternate culture of grains and legumes. He defined the principle briefly as a scientific and systematic plan for the growth of crops over a number of years on the same piece of land, by means of which the best crops were raised and the fertility of the land retained. Experience had long ago proved the principle to be sound, and science had later explained the reason. The benefits to be derived from a judicious rotation of crops were (1) the maintenance of soil fertility and (2) the keeping down and extermination of weeds and pests. A single crop grown continuously meant similar methods of soil preparation and cultivation every year, and some weeds, on account of their particular habits of growth, thus avoided extermination; whereas, if different crops were grown, the methods and time of cultivating being different, the weeds were destroyed.

It would readily be seen that the same would be true of diseases and insect pests. A third advantage of rotation was due to the root systems of plants being different; some deep-rooting plants left the soil more open for the benefit of other crops.

There could be no hard and fast rule as to the best rotation. Climate, character of soil, and market facilities, Mr. Burton pointed out, all had to be considered. The rotation of crops, as adopted at the Grafton Experiment Farm, appealed to the speaker—potatoes followed by cowpeas, then wheat followed by maize.

Leech's Gully.

The monthly meeting of this branch was held on the 14th July, when there was a good attendance of members and seventeen new members were enrolled. Mr. D. B. Weir mentioned the fact that the farmers in the surrounding district were becoming alive to the good work done by this branch, and he urged each member to bring one or two new members' subscriptions to each meeting.

Mr. Chick asked the Secretary "if he had a paddock of maize stalks which he intended turning under, would he advise rolling the land after ploughing or harrowing it." The Secretary stated that "he would neither roll nor harrow the paddock until a fair amount of rain had fallen in order to allow the moisture to get well down between the furrows to the stalks; he would then harrow across the furrows so as to level the ground and smother any young weeds appearing."

Little Plain.

Mr. Samuel Leech read the following paper to members at the last meeting of the branch.

Pig-Raising.

In the first place I would say that I do not think it pays to rear pigs if you have to buy food for them. The first and most important thing, therefore, is to be sure to grow your own feed, with perhaps the exception of a little pollard for the young pigs at weaning time. In answering the question which is the best breed, I will only deal with three breeds, those being, in my opinion the only ones worth consideration—the Berkshire, Yorkshire, and Tamworth. The last I do not like by itself, but excellent baconers are produced by crossing Tamworths with Berkshires; in fact, this cross is the most popular with perhaps a majority of pig-raisers. There is no doubt that the Berkshires are general favourites, but it must be remembered that the favourite does not always win the Cup, and I must say after giving the Berkshires credit for many good points, that my favourite pigs are the Middle York and the York-Berkshire cross. My reason for this is that I consider the Yorkshire will grow into a first grade bacon pig on less feed than any other breed and in less time.

In crossing Yorkshires and Berkshires, I prefer using the Berkshire boar, because I consider the Yorkshire sow a better mother than the Berkshire, and it takes very little to keep her in condition between litters, in fact they are sometimes inclined to make too much fat for breeding purposes. I find, too, that the Berkshire gives the Yorkshire a more robust growth, and the Yorkshire blood reduces the inclination to coarseness noticeable in some of the Berkshires, and also takes away some of that everlasting squealing whenever a bucket is rattled—and also when it is not. In speaking of the Yorkshire, I always mean the Middle York, because, although I believe the Large York to be a good pig, his hams do not develop until he is too heavy for a first grader. I know some do not like the York because they fear the sun is too hot for his white skin, but I have reared them exposed to the sun, and have never seen a sign of scalding.

Having decided that very important question of what to breed, and having a sow that is due to farrow, it is important to provide a dry sheltered pen without too much bedding, for superfluous bedding is a very frequent means of smothering the young pigs. After the pigs are two or three days old, the mother should be fed not less than three

times a day—each time as much as she will eat and clear it all up. If any is left in the trough it will not only go sour, but the sow will lose her appetite and will not do as well.

As soon as the young pigs begin to feed, it is advisable to provide a small trough where the mother cannot get at it, and to feed them with milk or a little pollard. If the mother is a valuable one, it is advisable to shut the pigs away from her in the daytime after they are five weeks old, feeding them in their own troughs. Then, if at the end of their sixth week they are wholly weaned, it will be found that they will not be checked in growth provided they are well fed.

Castration should be done when the pig is about a month old. After the pig is independent of its mother, and until such a time as he is shut in the fattening pen, he should have a fair amount of run. If available, milk is the best feed, but a pig would not fatten successfully running about. I find corn and pumpkins good for fattening. I break the pumpkins into a 50-gallon pot, just covering them with water, and when they are boiled they mash into a nice sloppy feed, and, with corn, make a splendid ration. No doubt where milk is available it would be equal to the pumpkin, but all milk should be boiled for the pigs, who not only thrive better on it, but pass the inspector better.

It is sometimes said of horses and cattle that half their breeding goes down their throat. That may be with regard to the stock referred to, but it is not so with pigs. It is the quality only that goes down a pig's throat, and to be successful one must have breeding as well. The whole secret in rearing pigs is to get well-bred ones and keep them going without a check until the day you send them to market.

I believe there is a great future in this district for the pig-raising industry, and having a factory on the spot is a great advantage. I have sent pigs to Sydney and also to Maitland—mostly to the latter. I have only sent two consignments to the local factory, but I am glad to say with better results than from either of the other places. The reason I prefer the local market is that if one has only two or three pigs, they can be put on a truck at any time at a very little cost, whereas it is too expensive to send less than half a truck to Maitland, and even if you have sufficient for a half or full truck they would be sure to vary in size, so that some would be too heavy before others were big enough. One can send to the local market as soon as a few are heavy enough for first grade, and this will represent a great saving in feed, for I do not care where they are sent, over-heavy pigs will not bring as much money in proportion to weight; again it is useless to send pigs of 80 lb. or 90 lb. to any bacon factory. A further advantage of the local factory is that one can go there and see their pigs weighed, and (what is better still) can see their own pigs alongside other pigs. Owners that send their pigs to, say, Maitland or Sydney, are sometimes surprised to find their pigs only brought about £1 when at the same sales others brought perhaps twice that amount, but if they had been present and had seen how their own pigs looked beside those high-priced ones they would have been quite satisfied.

I would advise anyone that means to raise pigs, first to get well-bred stock, and then feed well all the time. It must always be remembered that fattening pigs are no better for having more feed at one time than they can eat, but a well-bred and well-fed pig should make up to about 135 lb. when six or seven months old. Give them a warm, dry place to sleep in, as this saves feed, for naturally a certain amount of feed goes to supply warmth. In my opinion on these lines pig-raising can be made a very profitable industry.

Lower Portland.

At a meeting of the Lower Portland branch of the Bureau held on 11th of August last, a paper was read by Mr. J. Metherell.

Seasonable Work in the Apiary.

The paper stated that the apiarist's chief care at present was to see that his hives were filling with bees in readiness to gather such nectar as might be forthcoming during the approaching warm weather, for the more populous each colony was, the more honey it could store. At this time of year, it was well to unite the very weak colonies in an apiary, killing the poorest queens and allowing the most prolific to head the colonies formed by uniting several weaker ones. It was payable to build up other colonies not so weak as this by adding frames of a brood, taken from strong colonies, to their brood nests; the young bees emerging from the additional brood would strengthen the weak colonies, and being nurse bees would stimulate the queens, causing them to lay faster. It was necessary to keep bees from swarming, and this could be done by giving sheets of comb foundation to colonies and by adding supers. A lot of trouble could also be saved from

swarming by clipping one wing of the queen. If a clipped queen attempted to swarm, she could not fly and was easily found at the entrance of the hive, where she could be caged and placed in another hive on the same stand as she attempted to swarm from. The old colony being removed, the swarm would enter the new hive and the queen could be released. It was better to go in for a few strong colonies than to attempt a large increase in stock which produced weak colonies which could scarcely more than keep themselves.

Much interest was shown in Mr. Metherell's paper, in which he dealt with other branches of bee farming, and he also replied to questions put by members.

Mr. A. E. Massy, M.R.C.V.S., Government Veterinary Surgeon, delivered a lecture on "Parturition of Farm Animals" to members on the evening of the 8th September. There was an excellent attendance and great interest was shown. After the lecture there was a useful discussion, many questions being asked.

Middle Dural.

A branch has been formed at Middle Dural, with the following office bearers:—Chairman, Mr. C. W. Roughley; Vice-Chairman, Mr. G. W. O'Connor; Hon. Treasurer, Mr. Arthur E. Best; Hon. Secretary, Mr. H. Porter. Meetings will be held in the local public school, and the annual subscription has been fixed at 5s.

Milbrulong.

Mr. H. S. Major, assistant to the Sheep and Wool Expert, spent four days in this district in the middle of August, in order to class the sheep belonging to members of the local branch of the Agricultural Bureau. The flocks, which are capable of improvement, varied in size from 500 to 1,200 head, the pure Merino being utilised in conjunction with wheat-growing.

Classing Sheep.

On the afternoon of the first day the members interested in sheep assembled at the sheep-yards of Mr. Gollasch, where Mr. Major explained the aims and advantages of sheep-classing, and used the different types of sheep and wool to illustrate his remarks.

Sheep-classing is a matter of comparison. There are no standards for any particular class, each sheep being judged according to the average standard of the flock. Because one farmer's sheep are much inferior to those of his neighbour, it does not follow that about 80 per cent. of his ewes should be rejected. Everyone must make a beginning; and if the methods of selection have been correct, a big improvement will be noticed in five or six years. Ewes of average standard and those above the average should be retained, whilst those below should be rejected as "culls," which, in sheep classed for the first time, generally amount to about 33 per cent. of the flock. Perfection in any animal is seldom seen; but there should be a fair blending of all desirable characteristics in the sheep selected. In their selection of Merino ewes, farmers were advised to aim at size, depth of barrel, and width behind, in other words, "roominess"; while to obtain weight of fleece, the object should be a big frame, with long, good yielding wool, of high character and even quality, rather than a heavy fleece of short-stapled, uneven quality wool of a fatty nature, such as is usually shorn from the smaller-framed, wrinkly type of Merino. The rams employed should be of the one strain, if possible, and of a uniform type. Merino sheep carrying absolutely straight-fibred wool should be rejected, regardless of their merits in other directions.

The best time for classing is prior to shearing, when the sheep carry nearly twelve months' growth of wool, as their merits from a wool-bearing point of view can then be best considered.

In all, five farms in the district were visited. The sheep were yarded, and the ewes examined individually in the forcing-yards, after which each one was released by way of the drafting-race, or through one of two corner gates (kept half open), into the proper yard, one being for culls and another for selected ewes. About 35 per cent. were rejected, chiefly on account of being *too small and badly woolled.*

Farmers were soon able to observe that the manner in which the head was covered was the best outward indication as to the length of wool on the body. A sheep with a good scrag and top-knot is generally well-woolled on the body and lower portions of the legs. A few cases of "devil's grip" were met with, and the seriousness of this fault was explained. The ragged and emaciated appearance of a few sheep badly infested with lice was made use of to illustrate the advantages of dipping. In this respect there was a marked contrast in the general condition of the wool of one farmer's sheep which had been dipped and those of his neighbour which had not.

The culls can be either ear-marked (a punch-hole in the age-ear) or branded on the top-knot with fluid, so as to distinguish them at shearing time, after which they should again, in the latter case, be branded, so that they may be separated prior to the mating season. It is best to run the culls in a separate paddock, but the farmer has not always one available. It is advisable to sell the culls "off shears," and they should only be bred from in the event of the farmer being understocked, in which case their progeny should be kept separate from the offspring of the selected ewes.

In the case of the wet ewes which had not previously been classed, it was necessary to box the sheep again on account of their lambs being too young to wean; but the culls were marked as stated above. Old ewes should be mouthed previous to mating season, and the condition of the pastures will suggest the advantage or not of retaining broken-mouthed or gummy ewes of a good type for another year. Crossbred ewes should be classed chiefly for size, compactness, and length of wool, which should bear a close relation to its quality—the finer the wool the shorter the staple, while, on the contrary, the coarsest wool should be the longest. The different grades as indicated by the quality of wool should be separated in readiness for next mating. The farmer should carry out this classing, and mate the ewes with a definite object in view as to the progeny, and so as to avoid the production of too many grades in a small flock, for that would result in a mixed wool-clip. Next in importance to the introduction of good rams, the annual classing of the ewes is the best means of uplifting the average standard of a flock. This work is one which should appeal to farmers, and the assistance offered by the Department might be taken advantage of by larger numbers.

Redbank.

Mr. H. C. Coggins, Assistant Inspector of Agriculture, gave a demonstration in clearing and subsoiling with explosives before members of the above branch on Mr. Graham's farm. The demonstration was in every way successful, and those present were much impressed with the possibilities of this new method in connection with agriculture.

At the last meeting of the branch Mr. Graham read a paper on the cultivation of lucerne. He advocated ploughing to a depth of about 7 inches, then further stirring the subsoil to a depth of about 9 to 10 inches, and then applying from 4 to 5 cwt. of lime per acre. The autumn sowing was preferable to the spring, and the quantity of seed to sow was recommended as 10 to 12 lb. per acre.

St. John's Park.

Mr. H. C. Coggins, Assistant Inspector of Agriculture, conducted a demonstration on the use of explosives in agriculture on the 15th September. The Secretary reports that the members were impressed with the work, and that it will certainly have a good effect on the future of agriculture in the district.

Mr. King has resigned the secretaryship, and Mr. J. C. Scott is acting as Honorary Secretary.

Taralga.

Mr. A. J. Pinn, Inspector of Agriculture, gave a lecture on potato-growing to members of this branch on the 18th August.

The Growing of Potatoes.

Mr. Pinn first gave some interesting figures as to the acreage devoted to potato-growing in the various States. New South Wales figured very badly in the average yield per acre, and growers in this State also failed to get as good prices as those in other States, owing chiefly to carelessness in grading, bagging, &c. Certain local growers who had attended to those matters met with good results. The various potato districts were mentioned, and advice given as to the best time to market.

The soils met with in various districts were described, and the opinion was expressed that some of the finest land for potato-growing could be found in the Taralga district. Once railway communication was established, he believed it would become one of the great potato-producing centres of the State.

Ploughing should be commenced as early as possible. The first ploughing should be deep, from 8 to 10 inches, in order that when sowing at a depth of 4 inches a good seed-bed would be provided. The fallow should be well cultivated in order to conserve moisture and render plant-food available. The main trouble with old potato land was the deficiency of organic matter, and consequent lack of moisture. Growers were advised to supply this want per medium of green manure and rotation of crops, and the following rotation was recommended:—Potatoes, oats, wheat (hay), rape or field-peas.

The selection of good seed called for earnest consideration, and the present haphazard methods generally were condemned, a special seed-plot for the supply of farm seed being recommended. Small (seed) potatoes were of two classes—(1) late-formed tubers of a good plant, and (2) tubers of a plant of low vitality. The former might be relied on to produce a good plant, whilst little could be expected from the latter, and unless the selection was made by a careful person in the paddock, it could not well be done afterwards. Experiment showed little difference in crops grown from whole and cut seed. The farmer should use his own judgment, according to the condition of his seed-bed, &c. Seed potatoes needed ventilation, and as this could seldom be ensured in an earth pit, a well-ventilated shed should be used for the storage of seed.

Various methods of machine-planting were explained, and the great necessity for cultivation—first with the harrow, and later with the cultivator—was emphasised.

High hilling was advised, as it gave protection from sun-scald, frost, grubs, &c.

Harvesting the crop per medium of the fork and of the digging machine was mentioned. Under suitable conditions, Mr. Pinn thought there was a future in store for the digging machine. If blighty conditions were in evidence, he would advise not to dig immediately after the first frost; better let the haulms wither down a bit. On no account should stalks be gathered up in the paddock and used for covering bags or pits.

A short history of the best varieties was given, and the red-skinned varieties were recommended in preference to white skins, being more in favour with the buyers, and therefore finding a readier market.

At the conclusion of the lecture, which was illustrated by lantern slides, Mr. Pinn received a very hearty vote of thanks.

Tumbarumba.

A new branch has been formed at Tumbarumba, the officers elected being:—President, Mr. A. S. Livingstone; Vice-Presidents, Messrs. F. and R. Heinecke; Hon. Secretary, Mr. R. Livingstone. Meetings will be held in the local School of Arts, and the annual subscription fee will be 1s.

A Native Plant Pest.

If my readers will turn to the *Agricultural Gazette* for July, 1912, page 604, they will note that *Olearia viscidula*, Benth., a native shrub daisy, is recorded as a skin irritant in the Tamworth district.

The reason why men become affected by this plant is because it is destroyed by hand on a large scale, as it is looked upon as a pest.

The same plant has been reported from the Tallong district (midway between Moss Vale and Goulburn) in the following words:—

> It is growing in this part of the district very badly. If not checked it will take possession of the land and ruin all the settlers, as nothing will grow where it is. . . . It is really worse than the Briar or the Blackberry. We call it "White Bush."

It is, of course, a native plant, and it is very rarely the case that anyone complains of such as a pest. An instance, of course, is the White Thorn or Black Thorn (*Bursaria spinosa*) which grows in the coast district and table-lands, and is complained about because of its liability to fungous diseases and to scale insects, thus rendering it a danger to orchardists.

To eradicate a pest like this, which has fluffy seeds which blow all over the countryside, is exceedingly difficult, and the work can only be done in damp weather, and by men with leather gauntlets to protect their hands.

It usually grows in stony and rocky ground, and hence the difficulty of dealing with it with machinery is very great. Indeed, I know of no practical commercial method for the eradication of this plant on a large scale.—J. H. Maiden, Government Botanist.

ANSWERS TO CORRESPONDENTS.

[Inquiries addressed to the Editor will be answered by letter from the Department as quickly as possible. When the point raised is one of general interest, the reply will be repeated on this page, so far as space permits.]

NITROGEN IN WEEDS.—"A.S.": The organic matter in weeds, &c., that are cut off and left on the ground is converted into humus by weathering agencies, especially by the action of bacteria and moulds. The nitrogenous part is converted into ammonium salts in the first instance, and finally into nitrates. Ammonia is not given off to any extent when weeds and plants are allowed to rot on the surface of a soil, and the beneficial action is due partly to the formation of nitrates which enrich the soil, and partly to the formation of a mulch which protects the soil from undue surface evaporation.—F. B. GUTHRIE.

DAIRYING AT YANCO.—"B.T.": The Irrigation Commissioner has taken steps to procure good cattle for settlers on the Irrigation Area to select from, and quite a large percentage of the heifers purchased in this way by settlers have given 1 lb. of butter per cow per day when in full milk. These on their third calf should certainly give 250 lb. of butter per annum. A cow that will give 200 lb. of butter on the coast should give 250 at Yanco, under the feeding conditions that will apply there, because cows should never be short of fodder on an irrigated area.—M. A. O'CALLAGHAN.

HOW LONG AFTER MATING DO EGGS BECOME FERTILE.—"M.L.": Usually a percentage of eggs will be found fertile about the fifth day after mating, but rarely all until about the eighth or ninth day, more particularly if the birds have not previously mated. If the stock are mature, the eggs will be fit to put into the incubator after these periods.—J. HADLINGTON.

REMOVING THE COMBS OF POULTRY.—"M.L.": When the combs of hens obstruct their vision, the best plan is to take them off, using very sharp scissors or an old razor for the purpose. The birds should be kept separated from the general flocks till the wounds are healed, otherwise the other birds will peck at the raw surface.—J. HADLINGTON.

ARE INCUBATED CHICKS HEALTHY?—"J.A.": All other conditions being equal, chickens hatched by an incubator are just as strong and virile as those hatched under hens. On many of the largest poultry plants in various parts of the world, no hens are used, and incubators are solely relied upon to hatch not only for market purposes and laying, but also their stud birds. The reason why chickens sometimes pine away and die, may usually be assigned to faulty brooding.—J. HADLINGTON.

KILLING SUCKERING STUMPS.—"A.C.S.": This may be effected by making a frill ring around the stumps as close to the ground as possible. In this ring should be poured a solution of arsenite of soda (1 lb. to 5 gallons of water). This can be done by means of an old tea-pot. The operation should be carried out during February and March, as the sap is then on the ebb.—H. C. COGGINS.

Orchard Notes.

W. J. ALLEN.

OCTOBER.

Cultivation.

THROUGHOUT the spring and summer months, thorough cultivation should be given to orchards and vineyards; also after each rain the ground should be well worked to conserve as much moisture as possible, and prevent excessive evaporation. Under no circumstances should this important work be neglected. The soil around the base of all trees and vines should be loosened up to a good depth with a pronged hoe in the early spring, and occasionally during the summer, and any suckers found growing on either trees or vines should be removed. The present indications point to a very dry season. Notwithstanding the heavy rains which fell during the winter, the dry spell since has thrown orchard soils out of condition. It is, therefore, apparent that no effort should be spared to bring the soil into the best physical condition. For this purpose the spring-tooth cultivator should be constantly in use.

Care must be exercised on hillside lands to run out drains for the purpose of preventing any souring of the soil, more especially if the ground is worked down fine.

Fighting Codlin Moth.

Spraying for codlin moth is now compulsory, and any grower who has omitted the first spray should lose no time in making an application. The exact time must be governed by the district in which the grower resides. Soft water should be used for diluting the arsenate of lead; rain water is most suitable.

As a reminder to orchardists, the new regulation under the Vine and Vegetation Diseases and Fruit Pests Act, 1912, is given in full.

All apple, pear, and quince trees, and suckers shall be sprayed effectively not less than three times with an approved brand of arsenate of lead, in the proportion of not less than two (2) pounds of arsenate of lead with each fifty (50) gallons of water, or with such other substance or mixture as the Minister may direct in the *Government Gazette*, in the following manner, that is to say, the first spraying shall be completed within five (5) days after the petals have fallen from the flower. The second spraying shall be completed within four (4) weeks after the petals have fallen from the flower. The third spraying shall be completed within nine (9) weeks after the petals have fallen from the flower.

Provided that, if in the opinion of an inspector, the spraying has not been effectively carried out, or if he deems another spraying necessary the Minister may require the occupier or owner to apply a fourth application as aforesaid.

The success of such method is unquestionable. It has been proved time and again that those who spray systematically, and pick up and destroy all fallen and infested fruit, succeed in harvesting over 90 per cent. of clean fruit, while those who neglect spraying are lucky if they succeed in harvesting 40 per cent. of clean fruit.

Powdered forms of arsenate of lead are obtainable on the market. Some of our leading orchardists have given these a trial, and are more than pleased with the results. At the Bathurst Government Orchard, where one of these brands has been used, very good results have been secured.

Black Spot of the Apple and Pear.

It is now too late in most places for the winter dressing of Bordeaux mixture, which should be applied a few days before the trees burst into leaf and bloom. The second spraying should be given as soon as the fruit is well set, and may be used in conjunction with arsenate of lead.

Care should be taken to see that the mixture is thoroughly prepared, and that it is not applied when the trees are wet or during rain, as we have found that russeting occurs if this precaution is not taken. In spraying use as fine a nozzle as possible, and see that the whole of the tree, leaves, and fruit are covered.

The disease is not very prevalent in this State. In the Tableland districts however, trouble sometimes occurs with this fungus. Bordeaux mixture is being largely superseded by the application of concentrated Lime-sulphur. This material may be purchased from Sydney merchants and is in a condition for direct application after being diluted with cold water. The usual strength is 1–50, but growers are recommended to test several strengths. The one great advantage of this spray is that it does not russet the fruit in the way that Bordeaux does.

If it is decided to use the arsenate of lead and lime-sulphur combined, it is necessary to use great care, and the arsenate of lead should not be added to the lime-sulphur solution until ready to commence spraying. Thorough agitation should be given when using the combined mixtures.

Dormant Buds and Grafts.

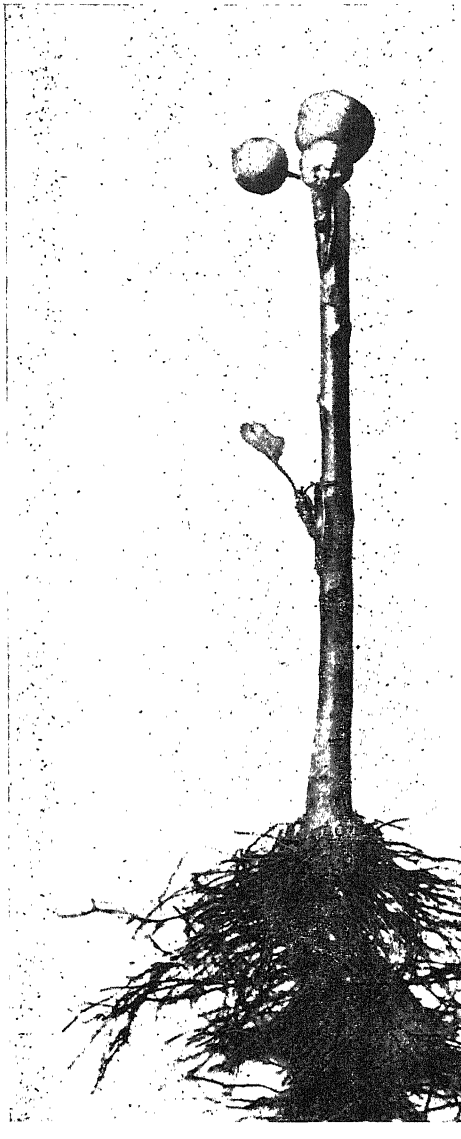
Keep all worked stock well disbudded, never allowing suckers to grow where either bud or graft is doing well. If the stocks on which buds were inserted have not been cut back, this should be done without further delay.

The cut should be slanting, being slightly lower on the side opposite the bud, and it is advisable to stake them, not only to prevent them being blown out, but also to encourage a straight trunk. Where grafts have been put in old trees they must be tied to prevent their being blown off. To do this a good stake should be tied to the branch grafted, and allowed to project a foot or more over the end; then as the graft grows, it can be tied to it.

Keep a strict watch on all refills and young trees, and if these show any signs of wilting, give them one or two buckets of water from time to time until they get a good start. Disbud all newly planted trees, leaving three or four good shoots, at least 4 inches apart, along the trunk of the tree. Do not allow two or three shoots to start from the same place, but give each branch a separate hold of the main stem. While working around trees, watch for borers on the trunks and branches, and it is very easy when they are just starting their work, to cut away the bark and find them, thus keeping the orchard free from these pests.

Grading Citrus Fruit.

Citrus fruits are still being harvested and forwarded to market. It should be unnecessary to urge upon growers the great need for care in grading and packing, but with all that has been written, there still exists a number of growers who appear so indifferent to their own interests that they forward to market badly packed and graded fruit.



Mr. Thomas Dick, Secretary of the Agricultural and Horticultural Society, Port Macquarie, forwards an interesting photograph, which we illustrate herewith. While it is unusual to see such a condition, it is by no means rare. When budding, care should be taken to select wood buds and if from some seasonable cause, blossoms appear, they should be removed.

Mr. William Jupp, of Bingleburra, Gresford, forwarded a small case of oranges from seedlings grown without the aid of manure. The fruit in question compares more than favourably with the seedling oranges usually produced in the older citrus districts of the state. It might be stated, however, that the seedling oranges from the Paterson and Gresford districts are noted for their quality.

Additional Skin Irritating Plants.

(See previous references in the *Agricultural Gazette* for February and December, 1909, December, 1911, and July, 1912.)

Humea elegans, alleged to be poisonous. This is an elegant plant found in the coastal and mountain regions in New South Wales. It also extends to Victoria. A favourite situation is at the foot of rock masses where there is a fair depth of soil. It is several feet high, and has elegant trusses of small pinkish flowers which are very sweet in perfume.

Owing to a fancied resemblance of the shape of the leaves and of the habit of the plant generally, it, with a number of other plants in New South Wales, often goes under the name of Native Tobacco.

Almost since the foundation of New South Wales it has been cultivated in English glass houses. A correspondent wrote to the Editor of the *Gardeners' Chronicle* for 24th May last, alleging that the foliage caused symptoms of eczema, and in the issue for 7th June the Editor replied that this is not usual. A further correspondent stated that he had suffered from inflammation of the eyes when standing on the leeward side of a clump when there was a breeze blowing.

Turning to *The Garden* of the 13th December, 1902, we see a similar statement made in regard to the effect of this plant on the eyes. A correspondent said that, forty years before, the poisonous qualities of this plant were brought painfully home to him after potting some plants. He was attacked by an inflammation of the eyes which lasted several days. This particular correspondent says that *Primula obconica*, a plant which is obnoxious to so many people (see the *Agricultural Gazette* for December, 1909), did not affect him.

Another correspondent wrote that he had suffered for some weeks with an inflamed eye, caused simply by drawing his hand over the leaves and afterwards rubbing the eye. This caused him much pain, almost as bad as being stung with a wasp.

Later on, 29th August, 1903, a correspondent drew attention to the injurious effect on Peach trees of the presence of *Humea elegans* in the same glass-house with them. The report seems to have been accepted without question.

Humea elegans is a plant known to so many people, and collected so frequently, that I wish to ask whether any people in Australia have ever heard of its injurious effects.

Dr. George Bennett in his work, "Gatherings of a Naturalist," wrote many years ago that the whole plant on being bruised emits a delightful scent, so overpowering as sometimes to produce headache, and he was of opinion that a valuable perfume might be obtained from it. This is the only reference that I have been able to glean in any way to the plant's detriment.

Doubtless it would not be so easy to make observations in regard to this particular plant in Australia, because they are all in the open air, whereas in North Europe they are confined in glass-houses. At the same time more than one correspondent points out that rubbing the eyes after touching a plant is injurious, and presumably similar, if less severe, results would ensue in New South Wales.

In this connection I again invite attention to the fact that in cases of dermatitis or skin irritation owing to contact with plants, some people are affected, while others appear to be non-affected on touching the same plant.—J. H. MAIDEN, Government Botanist and Director of the Botanic Gardens, Sydney.

GOOSEBERRY CULTURE.

IN reply to an inquiry from a Hartley correspondent, the Fruit Expert stated that he was of opinion that the soils of the district mentioned were suitable for the culture of both gooseberries and strawberries. The inquirer was further informed that gooseberries should be planted during the months of July and August and at distances about 5 feet apart each way, on soils which are not very rich. Pruning or thinning is carried out during June, July, and early August in the colder districts. This consists in removing a considerable portion of this and last year's growth. "Roaring Lion" is about the most profitable variety to grow. One of the best fertilisers recommended for that district is stable manure.

With regard to returns, so much depends on the land, care, season, supply and demand, that no estimate could be formed, as very little data are available. Ten acres planted with this fruit should be sufficient to keep a person going, provided he is in a position to employ help during harvest.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1913.

Society.	Secretary.	Date.
Yass P. and A. Association	... W. Thomson	... Oct. 1, 2
Millthorpe A., H., and P. Association ...	... C. J. E. Hawken	... ,, 7, 8
Urana P. and A. Society	... J. Wise ...	... ,, 7, 8
Hillston P. and A. Association	... S. J. Gordon	... ,, 8
Crookwell A., H., and P. Society (Spring Show)	... H. P. Levy	... ,, 10
Balranald P. and A. Society	... A. Malcolm	... ,, 15
Lismore A. and I. Society	... T. M. Hewitt	... Nov. 5, 6, 7
Tweed River Agricultural Society (Murwillumbah)	... A. E. Budd	... ,, 12, 13
Mullumbimby A. Society	... W. A. Davis	... ,, 19, 20

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1914.

Society.	Secretary.	Date.
Albion Park A., H., and I. Association	M. A. Brown	Jan. 14, 15
Kiama A. Association	G. A. Somerville	,, 23, 24, 26
Wollongong, A., H., and I. Association	W. J. Cochrane	,, 29, 30, 31
Berry Agricultural Association	S. G. Banfield	Feb. 4, 5
Dorrigo A., H., and I. Society	W. R. Colwell	,, 10, 11
Moruya A. and P. Society	H. P. Jeffery	,, 11, 12
Alstonville Agricultural Society	C. D. McIntyre	,, 11, 12
Guyra P., A., and H. Society	P. N. Stevenson	,, 17, 18, 19
Gunning P., H., and I. Society	J. R. Turner	,, 18, 19
Central Cumberland A. and H. Association	H. A. Best	,, 20, 21
Dapto A. and H. Society	J. H. Lindsay	,, 24, 25
Inverell P. and A. Association	J. McIlveen	,, 25, 26, 27
Uralla A. Association	H. W. Vincent	Mar. 3, 4, 5
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 3, 4, 5
Tumut A. and P. Association	T. E. Wilkinson	,, 4, 5
Braidwood P. A, and H. Association	L. Chapman	,, 4, 5
Oberon A., H., and P. Association	M. J. Looby	,, 5, 6
Central New England P. & A. Association (Glen Innes)	George A. Priest	,, 10, 11, 12
Molong P. and A. Association	W. J. Windred	,, 11
Coramba District P., A., and H. Society	H. E. Hindmarsh	,, 11, 12
Bombala Exhibition Society	W. G. Tweedie	,, 11, 12
Tumbarumba and Upper Murray P. and A. Society	E. W. Figures	,, 11, 12, 13
Wauchope P. A. and H. Society	A. D. Suters	,, 12, 13
Gundagai P. and A. Society	A. Elworthy	,, 17, 18
Bangalow A. and I. Society	W. H. Reading	,, 17, 18, 19
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Goulburn A., P., and H. Society	G. G. Harris	,, 19, 20, 21
Mudgee A., P., H. and I. Association	P. J. Griffin	,, 24, 25, 26
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Crookwell A., H., and P. Society	H. P. Levy	,, 26, 27
Luddenham A. and H. Society	F. C. Emery	,, 31, Apr. 1
Cooma P. and H. Association	C. J. Walmsley	April 1, 2
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins	,, 1, 2, 3
Royal Agricultural Society (Sydney)	H. M. Somer	,, 7–15
Adaminaby P. and A. Association	W. Delany	,, 15, 16
Batlow A. Society	C. S. Gregory	,, 21, 22
Bathurst A., H., and P. Association	J. Bain	,, 22, 23, 24
Hunter River A. and H. Association (West Maitland)	E. H. Fountain	,, 22, 23, 24, 25
Tamworth P. and A. Association	J. R. Wood	,, 28, 29, 30
Richmond River A. H. and P. Society (Casino)	D. S. Rayner	,, 29, 30
Orange A. and P. Association	W. J. I. Nancarrow	,, 29, 30
Northern Agricultural Association (Singleton)	E. J. Dann	,, 29, 30, May 1
Clarence P. and A. Society (Grafton)	G. N. Small	May 6, 7, 8
Hawkesbury District A. Association (Windsor)	H. S. Johnston	,, 7, 8, 9
Lower Clarence A. Society (Maclean)	J. McPherson	,, 12, 13

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till
Shorthorn ...	Pansy's Progress	Dora's Boy ...	Pansy 4th (im.)	Wollongbar Farm	*
,, ...	Imperialist ...	Florio	Lady Nancy of Minembah.	,, ,,	*
,, ...	March Pansy ...	Earl March ...	Australian Pansy	Grafton Farm ...	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
,, ...	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	,, ,,	*
,, ...	Elaine's Heir ...	Thessalian II ...	Wagga Elaine	Yanco Farm ...	*
,, ...	Royal Blood ...	Berry Melbourne	Calceolus ...	Wollongbar Farm	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie ...	Berry Farm ...	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Wagga Farm ...	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Kyogle	31 Dec., '13.
,, ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	,, ...	5 Mar., '14.
,, ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Maclean	11 Jan., '14.
,, ...	Prince Souvia ...	Vivid's Prince...	Souvenir(imp.)	Grafton ...	*
,, ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Wollongbar Farm	*
,, ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 Oct., '14
,, ...	Sunshine ...	King of the Roses	Princess Vivid	Grafton	31 Dec., '13.
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	Claudius (imp.)	Golden Star II..	Claudia's Pride(imp.).	Tweed River ...	18 Feb., '14
,, ...	Trengwainton Village Favourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Jones Island ...	31 Dec., '13.
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (im.)	Bega	20 Dec., '13.
,, ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Kyogle	1 Mar., '14.
,, ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel(imp.).	Murwillumbah ...	10 Nov., '14.
,, ...	Prince of Warren Wood (imp.).	Kingsmoor Governor (1952)	Quail (7051)	Macleay River ...	8 Dec., '13.
,, ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Frederickton ...	20 Dec., '13.
,, ...	Rosehill (imp.)..	Northesk (2073)	Faultless Footsteps (6132)	Raymond Terrace	19 Dec., '13.
,, ...	Duke of Orleans	Godolphin Arthur (1664)	Flower of the Preel 3rd (imp.)	H.A. College, Richmond	*
Ayrshire ...	Jamie's Heir ...	Jamie of Oakbank	Miss Prim ..	Wollongbar Farm	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose..	Grafton Farm ..	*
,, ...	Orphan Boy ...	Songster of Greystanes.	Rosamond ...	Glen Innes Farm..	*
,, ...	Wyllieland ... Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A. College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin(imp.)	Bratha 4th ...	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ..	*

*Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.

Department of Agriculture,
Sydney, 2nd October, 1913.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

JERSEY.—Foxtail : sire, Xmas Fox (imp.); dam, Bellona; calved 24th April, 1912; colour, whole fawn. Price, **20 guineas.**

Bellona was by Optician (imp.) from Pattibelle (192). Pattibelle (192) was by Lily's Boy (imp.) from Claribelle (imp.) Bellona gave 4,362 lb. of milk, testing 5·9 per cent., equal to 304 lb. of butter.

GUERNSEYS.—Haymaker: sire, The Peacemaker; dam, Hayes Muzette 7th (imp.); calved 5th January, 1912; colour, lemon and white. Price, **40 guineas.**

The Peacemaker is by Calm Prince from Rose Petersen.
Calm Prince is by Rose Prince (imp.) from Gentle (imp.).
Rose Petersen is by Peter (imp.) from Rose Petal. Rose Petal is by Rose Prince (imp.) from Saucy Sal (imp.).
Hayes Muzette 7th (imp) in 1911 yielded 5,620 lb. of milk, testing 4·6 per cent., equal to 304 lb. of butter.

Lassie's Favourite: sire, Trengwainton Village Favourite (imp.); dam, Rohais Lassie 2nd; calved, 14th June, 1912. Price, **£30.**
Rohais Lassie (imp.), dam of Rohais Lassie 2nd, gave 333 lb. butter in 42 weeks.

The Saint: sire, Trengwainton Village Favourite (imp.); dam, Angel Vivid; calved, 8th July, 1912. Price, **£30.**
Angel Vivid gave 318 lb. butter in 36 weeks.

Four-leaf Shamrock: sire, Calm Prince; dam, Shamrock of Les Vesquesses (imp.); calved, 26th November, 1912. Price, **£30.**
The dam of this bull gave 285 lb. butter in 41 weeks.

King of the Preel: sire, Trengwainton Village Favourite (imp.); dam, Flower of the Preel 3rd (imp.); calved, 31st December, 1912. Price, **£30.**
The dam of this bull gave 332 lb. butter in 40 weeks.

AT COWRA EXPERIMENT FARM.

JERSEY.—Shakespeare : sire, Sir Pat; dam, Leading Lady; calved 13th January, 1912; colour, whole fawn. Price, **20 guineas.**

Leading Lady is by Berry Melbourne from Lady Tidy 4th.
Lady Tidy 4th was by Golden Lord from Lady Tidy 3rd (imp.).
Berry Melbourne is by Melbourne (imp.) from Rum Omelette (imp.).
Sir Pat is by Sir Jack from Pattibelle (192).
Leading Lady, on her first calf, yielded 3,346 lb. of milk, testing 6 per cent., equal to 237 lb. of butter.

HOLSTEIN COWS FOR SALE.

BERRY EXPERIMENT FARM.

Name.	Date of Birth.	Sire.	Dam.	Price.
				£
Lolkje Field (in calf)	12 Nov., 1904 ...	Garfield	Lolkje	20
Fraulein Arama (in calf) ..	4 Feb., 1907 ...	The Hague ...	Dina's Douwe ...	25
Marigold (in calf) ...	25 Feb., 1907 ...	The Hague ...	Margosa	25

GEORGE VALDER, Acting Under-Secretary.

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Agricultural Gazette of New South Wales.

The Tuberculin Test.

AN ANSWER TO SOME RECENT CRITICISM.

MAX HENRY, M.R.C.V.S., B.V.Sc.

DURING the progress of veterinary science many tests for different diseases have been evolved, but of them all none have stood the test of practical application so well as tuberculin and mallein, the respective tests which are applied for tuberculosis and glanders. This has been achieved not because they have been but little used, and so defects have escaped notice, but in the face of much opposition both amongst laymen and veterinarians, although the opposition of the latter has been overcome by noting the results obtained, and as a result of continuous and widespread experimentation and application.

Again, veterinarians have always been willing to recognise the limitations of these tests, and knowing these limitations, and giving due allowance for them, they have been very strong in their defence of the tests when unwarrantably attacked.

Of course, it is recognised that much of the criticism to which the test is subjected is due to ignorance both as to the essential nature of the test, and as to the methods of its application, but at other times this criticism is influenced to some extent by hostility to the test of an active, although unreasoning, nature, and even in some instances is urged by monetary considerations.

It is fully recognised that much work of an educative nature is always necessary before the general public learn to appreciate both the advantages and drawbacks of any scientific application, since too often they allow some chance-heard remark as to its drawbacks to influence their whole outlook.

Before dealing with some of the criticisms levelled at these tests, a short description of the materials used, of the method of their application, and their essential nature, will assist in making the question clear. We are in this State fortunate in being free from the terrible scourge of horses known as glanders, and consequently the mallein test does not come prominently before the public eye, although it is continually being applied to horses coming from abroad.

Tuberculin, on the other hand, is daily being used amongst the farmers, and it is to a consideration of the use of this material that we shall confine ourselves, although mallein is of the same nature, and acts in a similar fashion.

Tuberculin is the bouillon in which the tubercle bacillus has been grown charged with the toxic products of its growth, but which has been raised to a boiling temperature to destroy all germ life, and from which the dead

germs have been removed by passing it through a porcelain filter. (Law, Veterinary Medicine, Vol. IV, p. 502.)

The above concise statement is all that need be mentioned in connection with the manufacture of tuberculin, as it emphatically shows that it is a germ-free product.

The injection of a certain quantity of this material into an animal, while it has no effect on a healthy animal, causes a rise in temperature in a beast with tuberculosis.

In testing, cattle must be kept as much as possible under their usual conditions. The temperature is taken two or three times on the day before testing. The tuberculin is injected under the skin with a hypodermic syringe and the temperatures are again taken at 9th, 12th, and 15th hour after injection, and, if necessary, on the 18th and 21st. Should the temperature show a gradual and maintained rise to over 104 degrees (F.), the animal is considered a reactor; should it remain below 103 degrees (F.), as a non-reactor; and between 103 degrees and 104 degrees as doubtful.

Let us now take in order the drawbacks most commonly urged against this test:—

1. *It is frequently urged that tuberculin causes tuberculosis.*

If the method of manufacture be considered, it will be seen that this is impossible.

2. *Tuberculin is often blamed for causing local abscesses and swelling.*

In almost every case this is due to lack of cleanliness. During the last three years the veterinary officers of this State have made over 2,500 tests, and in not a single instance has any local abscess occurred; and such is the experience of all careful veterinarians.

3. *Tuberculin is said to be dangerous to cows in calf.*

It is at first sight difficult to grasp in what way it is held to be dangerous, especially if, as was the case with a recent critic, it is declared to be quite safe for bulls. One can only assume that it is held it might cause the cow to abort, but hundreds of cows are yearly tested in all stages of pregnancy without any such accident being noted.

4. *It is sometimes held that repeating a test is dangerous.*

In this connection Professor Law (Director of the New York State Veterinary College) quotes an instance in his Text Book of Veterinary Medicine, in which he subjected a herd to six tests at intervals of from five to fourteen days, and states, "It led to no appreciable change of the general health as shown by the temperature, breathing, pulse, yield of milk, or its quality."

Many of the cattle now in Government herds have been tested three or four times at six months' intervals, and are to-day as healthy as before they were tested once. Not only do they appear healthy outwardly, but records are kept of the results of *post mortem* examination when killed (for beef or other reasons) and these show that such as have been killed are also healthy inwardly.

On the question of this safety, Professor Law says: "Many stock-owners still entertain an ignorant and unwarranted dread of the tuberculin test. It is quite true that when recklessly used by ignorant or careless people it may be made a root of evil; yet as employed by the intelligent and careful expert, it is not only perfectly safe, but it is the only known means of ascertaining approximately the actual number affected in a given herd."

The last International Commission on Bovine Tuberculosis in America have placed on record their belief that tuberculin is absolutely harmless to healthy animals.

Now, tuberculin has again been largely employed as a diagnostic agent, by ophthalmic test, both on cattle and human beings, and in a report presented by Bailliart to the International Congress of 1908 (*Journal of Comp. Path. and Ther.*, December, 1908), he gives results of many hundred cases in both cattle and men which showed excellent results, and practically no drawbacks, as far as health was concerned, when used on healthy animals or men.

5. *It is sometimes declared that the use of tuberculin can in some way predispose an animal to an attack of the disease.*

That such is the case is not believed by anyone with an extensive knowledge of the test, and only the other day the International Commission on Tuberculosis in America declared that the first step in eliminating the disease from a herd was to apply the tuberculin test to every beast over six months, and that afterwards every calf at the age of six months should be tested before being passed into the healthy herd. Such advice would certainly never have been given had the Commission entertained any such fear.

This question is also to some extent answered under heading (4) as far as local conditions are concerned.

Perhaps, however, the best work in disproving such an idea is the work carried out in Denmark by Bang (*Journal of Comp. Path. and Ther.*, December, 1908). In his system the application of tuberculin was an essential factor in cleaning the herds, and considerable success was achieved, but his methods have the drawback of involving extra work and many precautions which most farmers will not or cannot carry out. It is interesting to note that in his report to the International Congress on Tuberculosis in 1908, he expressed the opinion that the best method of rooting out tuberculosis in a large herd amongst which the disease had long been prevalent, would be to subject at first only calves and young cattle to the test, and, further, in commenting on Ujhelyi's scheme for combating tuberculosis in cattle he says: "Of course the isolated calves should be subjected to half-yearly tuberculin tests." Obviously Bang, whose great life work has been the study of tuberculosis in cattle and the methods of combating it, had no fear of the tuberculin test as a predisposing agent, not even when applied in a highly tubercular atmosphere, which, according to some critics of the test, is likely to have a bearing on the case.

In this connection it is worth while noting that exactly the same tuberculin as is used by us in testing cattle here is used as a diagnostic and curative agent for tuberculosis in human beings under the direction of Sir A. E. Wright and his pupils and followers. R. W. Allen, in "Vaccine Therapy," holds that in cases in which tuberculosis in human beings has been contracted from bovines, that tuberculin prepared from the bovine strain of tubercle bacillus is more efficacious than that prepared from the human strain as a therapeutic agent.

It is sometimes said, "But suppose you happened to give an overdose?" The writer of this article on one occasion gave a cow seven times the usual dose of tuberculin. Her temperature next morning was normal, she showed no constitutional disturbance, milked as usual, and twelve months later passed the test satisfactorily again.

Allen, in "Vaccine Therapeutics," says that the statement is usually made that the result of the injection of a bacterial vaccine upon the index to that organism of a healthy person is very slight. Any subsequent depression of the index is stated to be of a very temporary character, and of only small extent, while the rise of index which follows the return of the normal is also of a limited and slight character. This statement is substantially true for the tubercle bacillus.

The index referred to is the Opsonic Index, a means by which the resistant power of a man or animal to any given disease may be estimated; a rise indicates increased resistance, a fall decreased; and it is thus evident from Allen's account that the alteration of resistance in a healthy man as a result of the injection of a tubercle vaccine is negligible, and we have no reason to suppose the obverse in the case of cattle.

6. *It is stated that tuberculin given to a beast already suffering from tuberculosis is liable to cause that disease to be accelerated and intensified.*

This argument is based on two points:—

(*a*) An analogy with tuberculosis in human beings;

(*b*) The fact that cattle have been found extensively tubercular within a comparatively short period after testing, and have shown clinical symptoms where previously they did not.

The first point is based on the fact that when tuberculin was first introduced as a "cure" for tuberculosis, large doses were administered, and patients under the treatment in some cases rapidly became worse, and that large doses do in many cases cause very serious constitutional disturbance.

Do we note severe constitutional disturbance in cattle as tested in the ordinary method? Anyone with large experience knows that beyond the anticipated rise in temperature, with possibly some slight dulness and the ordinary signs of fever, we do not.

Professor Stewart, of the Sydney University Veterinary School, in the *Agricultural Gazette* of March, 1912, in an article which anyone interested in the question is recommended to read, says: "Those who have had most experience with tuberculin have failed to observe any injurious effects

following its use upon healthy cases, and the statement once made by Hess, that the reaction produced a worse condition in tuberculous animals than before existed, is now generally discredited."

To quote a concrete instance of local occurrence:—A herd of dairy cattle was tested in September, 1909, and the reactors placed in a separate herd. They were kept under good hygienic conditions, and fed as usual, and were gradually killed off, the last batch being slaughtered over two years after the date of testing. During that two years they remained to all appearances perfectly healthy outwardly, as they had been before the test, and on slaughter they were found affected in different degrees, varying from a slight lesion in the mesenteric glands (only found with difficulty) to a fairly extensive infection of the glands, lungs, and liver. In the majority of cases the infection was so slight that the carcases could be passed for food; and of the last batch of five killed, which one would expect to be most severely affected, only one out of five was sufficiently diseased to warrant condemnation. In none was there any reason to suspect that the administration of tuberculin had accelerated the course of the disease.

The second point on which this argument is based is, as a little thinking will show, one which it is wellnigh impossible to prove, and in which there are a number of other explanations at least equally likely, and in the opinion of those best qualified to judge, much more likely.

It frequently happens that an animal is tested and passed. Some months later the animal begins to show clinical symptoms of tuberculosis, and this is put down to the test. Before one dare say that the test was responsible for this, it would be necessary to show (*a*) that all the cattle with which the animal was running and the men handling them were free from the disease, and so contagion was impossible; (*b*) that there was not present an initial or latent tuberculosis which would have developed in any case, whether the animal had been tested or not. (The possible failure of tuberculin to detect such a case will be dealt with later.) Now, it is a common experience with anyone with large experience with dairy cattle that an animal apparently in perfect health to-day (whether really diseased or not is immaterial to the argument) may three months hence show obvious clinical symptoms without any testing or other interference. Can the supporters of this argument show that the percentage of tested cattle which behave in this way is greater than the percentage of untested cattle, due allowance being made that it is usually in highly tubercular herds that testing is more generally applied.

We confidently believe that they are quite unable to, and that their argument is in the beginning based on one or two isolated cases which have come under their notice, and that they have neglected to take into consideration the many obvious other modes of explaining the infection if they are dealing with a previously healthy animal.

Much has been made lately of the fact that some imported cattle, after passing the test here, were destroyed as tubercular after some months. Now, these animals very largely belonged to breeds which are to some extent

more susceptible to tuberculosis than average cattle, they had just undergone a sudden change of climate, and had but just recovered from the debilitating effects of a long voyage, circumstances which must have some bearing on their resistance to the disease. Further, in some cases at any rate, they were sent to a farm which has been notoriously tubercular, and in which isolation providing for absolute protection from contagion is very difficult. Then on the farms to which they were sent in the country were cattle which had never been tested, and whose condition as regards tuberculosis was unknown, yet, when they are shown to be tubercular, the whole blame is placed on the tuberculin test. Such a line of argument, in our opinion, shows a bias, possibly unconscious, against the test, which is undeserved.

We regard it as a statement unwarranted by actual experience to declare that a farmer who tests his herd may expect to see some of his reactors in a short while and as a result of the test develop manifest symptoms. He may certainly always expect some of his non-manifest cases to become manifest, test or no test, in the natural course of the disease, but there is entirely wanting evidence to inculpate the application of the test.

Now, let us suppose that tuberculin would cause an acceleration of the disease, and did so, what practical bearing would that fact have? Would it make us loth to advocate testing? By no means. The animal which of all others is dangerous to the farmer, to his cattle, and to the people who consume the products of his cattle, is the non-manifest case, because nobody knows that it is diseased save by the test. If it reacts again, it is impossible to say to what extent it is diseased; and although one may by bacteriological examination decide to some extent whether it is an active source of contagion or not, it is impossible to say at what time it may not become so. The object of the tuberculin test as intelligently applied, is to detect non-manifest cases, so that measures may be taken to prevent their spreading the disease; it is the only means by which this may be done, and if in a few cases this caused cows to show manifest symptoms rather sooner than they might otherwise have done, we would regard it as a small matter, and any farmer with a true regard for the health of his herd would also do so, for the immediate monetary loss would later be more than made up to him by the increased yield and greater reputation, and lowered mortality amongst cattle and pigs, which would accrue to him as a result of his possessing a clean herd.

It may not be amiss here to point out that the economic side of this question is too much neglected, but it will be forced into prominence as population increases, and dairy cattle and pigs become of greater value. How many thousands of cattle die, or are condemned, in this State yearly from tuberculosis? The official figures last year said 9,459, but this represents only a portion of the loss. What numbers of pigs die, or are condemned at slaughter-houses for this disease? What is the decreased milk yield as a result of milking cows in all stages of tuberculosis? How many men are incapacitated yearly through tuberculosis? It is impossible to answer these

questions, and yet they represent an economic question of considerable importance.

Here, then, we have the keynote of the whole matter. Tuberculin properly used may be made an economic agent of considerable value, and if—which we do not believe—it might act as alleged, the drawback would be negligible compared with the results finally obtained.

Now, what are the real drawbacks of tuberculin as apart from the alleged disadvantages?

1. Tuberculin will not give any indication of the extent to which an animal is diseased. To some extent a very marked reaction is indicative of slight infection, but this is by no means a reliable indication. That is, of course, the obvious reason why it is a practical impossibility to enforce universal testing and slaughter of reactors; not only would it paralyse the industry, but it would be wholly unnecessary, as many of the reactors would not be infective. This does not alter its value as a diagnostic agent.

2. In very advanced cases, and in initial cases, tuberculin may not cause a reaction. Very advanced cases can generally be decided by clinical examination; initial cases are not likely to become dangerous for some time, and can usually be caught at a second test six months later.

3. The temperatures of cattle under certain conditions such as closely approaching parturition and œstrum, are variable to some extent, and may invalidate the test; but this can easily be overcome by deferring testing, and can certainly not be put down as a failure of the test.

4. Other factors, such as a marked change in the manner in which the cattle usually live, may alter their temperature, but all these matters are taken into account by careful veterinarians, and allowed for.

5. In a few cases, although an animal has reacted, no lesions have been found on *post mortem* examination, but there is no doubt that many of these would have revealed lesions with a more thorough search, and that unless the *post mortem* is made by a veterinarian, or someone with a thorough acquaintance with anatomy, very little reliance can be placed on the statement that nothing was found.

It must be remembered that in not a few cases in which an ordinary *post mortem* examination, even by experts, failed to reveal lesions of tuberculosis, the microscopic examination of smears and the injection of crushed glands into guinea-pigs have shown that the animals were affected, although the disease had not progressed far enough to cause visible lesions.

Having shown, then, that tuberculin is a perfectly safe, and almost infallible diagnostic agent, it may be asked whether we would recommend the universal and promiscuous distribution of tuberculin to the farmer.

Most emphatically not; in fact we would, if possible, confine the use of tuberculin to veterinarians, stock and dairy inspectors, and anyone who had undergone some training in its use, for, although the application of the test is in itself a simple matter, the interpretation of the results obtained is often a matter of some delicacy, and training and experience are necessary to assist the observer to decide as to what constitutes a reaction, and what does not.

Export of Apples from the Bathurst Experiment Farm.

THE export of apples from the Bathurst Farm has been continued during the present year with very satisfactory results. A consignment of 100 cases was forwarded to Sydney on 13th March, 1913, to be pre-cooled, and was shipped per R.M.S. "Moldavia" on 21st March through the Australian Co-operative Export and Distributing Company, Limited.

The agent's report on arrival was as follows:—

Jonathans—Very fine colour; larger apples slightly bruised.
Rome Beauties—Splendid fruit, nicely coloured.
Cleopatras—Exceptionally fine; a few pitted.
Five-crown Pippins—Very fine colour; a few boxes over-ripe and wasty.
Granny Smith—Very choice; a little short of colour.

We consider all the above fruit exceptionally well packed, even better than last year's consignments.

The Agent-General reported that the consignment arrived in excellent condition, and realised prices slightly in advance of late ruling prices, at the following approximate averages:—Granny Smiths, 12s. 6d. per case; Cleopatras, 11s.; Jonathans, 9s. 6d.; Five-crown Pippins, 8s.; and Rome Beauties, 10s. 6d.

A portion of the consignment was exhibited in the window of the Agent-General's Offices, and had the effect of attracting much attention, with the result that the London house of the agents was overwhelmed with inquiries for New South Wales fruit of the quality shipped this year. Unfortunately, the unfavourable season experienced would not permit of larger shipments being made.

The 100 cases realised a total of £53, from which a deduction of £5 17s. 2d. has to be made (comprising port dues, 1s. 8d.; London charges, £3 2s. 6d.; and commission, £2 13s.), leaving a return of £47 2s. 10d. In addition, ocean freights amounted to £13 10s. 9d., cartage 8s. 4d., and bill of lading 1s.

A similar consignment of 100 cases was forwarded to Hamburg per s.s. "Adelaide" on 14th March. Sales were effected by Messrs. Timm and Gerstenkorn at the following rates:—2¼ inch Cleopatras, 12·25 marks per case; 2½ inch, 13·50 marks; 2¾ inch, 14·50; 3 inch, 13·75; 2¼ inch, 2½ inch, and 2¾ inch Jonathans, all at 10·75 marks per case; and 2½ inch, 2¾ inch, 3 inch, 3¼ inch, and 3½ inch Five-crowns, all at 10 marks per case. At the time of sale the mark was worth 20·50 per £, or roughly a shilling.

The Cleopatras averaged 13s. 6d. per case, and the other varieties 10s. 3d. The total consignment of 100 cases, less commission, landing charges, &c., realised £54 1s. 2d.; ocean freight and cartage cost a total of £14 0s. 2d., or practically the same as that of the English consignment.

It will thus be easily seen what a satisfactory market for apples exists in England and Germany, merely awaiting regularity of shipment. With such prospects the future of the apple export industry should be assured.

Notes on some Winter Fodder Plants of New South Wales.

E. BREAKWELL, B.A., B.Sc., Agrostologist, Botanic Gardens.

An investigation was made during the recent winter into the uncultivated fodder plants of the North-western Slopes, the Central-western Slopes, and the Southern Tableland.

Medics.

One of the commonest fodder plants growing in the three districts named is *Medicago denticulata,* Willd. (Burr Clover, Burr Medic, or Burr Trefoil).

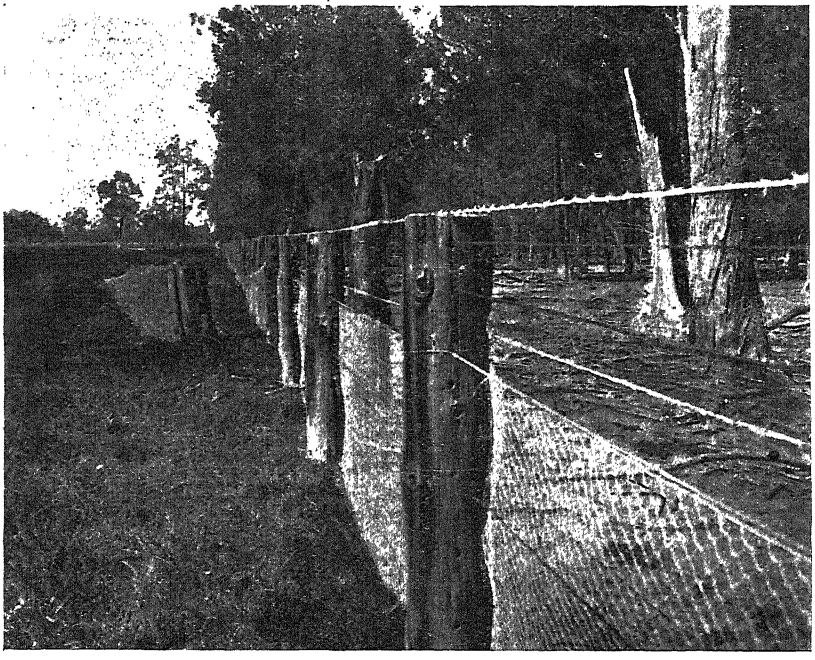


Fig. 1.—Pilliga Scrub (cleared and uncleared). In five years the cleared land has become capital grazing country.

While this plant belongs to the same family as lucerne (*Medicago sativa*) its habit is very different from the latter. Lucerne requires special soil, special drainage, and a good rainfall; Burr Medic will grow in both moist and dry situations, on both light and heavy soils, and does not require as much rain as lucerne.

On good soils, such as the river flats of Narrabri, Gundagai, Queanbeyan, and Condobolin, Burr Medic grows to a height of 2 to 3 feet, and it is there found that even heavy stocking cannot keep it eaten down.

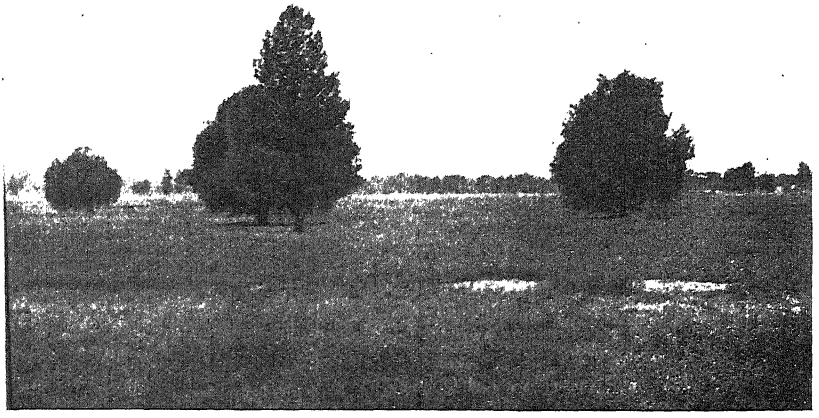


Fig. 2.—A field of Crowfoot (*Erodium cygnorum*) at Condobolin.

This plant has already been described by Mr. J. H. Maiden, Government Botanist, in the *Agricultural Gazette*, Vol. 7, p. 740. It is a great favourite with all pastoralists, principally on account of the large amount of feed it provides during the winter months, and also because of its nutritious burrs during the summer, when other feed may be scarce. These factors appear to overweigh the disadvantages the plant possesses with regard to its burrs.



Fig. 3.—Spotted or Variegated Thistle (*Carduus marianus*). The Thistle is the last plant to be eaten.

It is probable that the plant is more nutritious when it arrives at the burr-bearing stage. Chemical analysis of a succulent sample from the north-west, and with the burrs not yet formed, showed a relatively poor albuminoid ratio, but indicated that it was rich in carbohydrates.

No examples of hay made from Burr Medic were met with. It may be mentioned here that in America, where the plant is widely cultivated, it is not considered suitable for this purpose.

Growing in association with *Medicago denticulata* (but found in any quantity only in the north-west) is *Medicago laciniata*, another Burr Medic (Plate 1). The two plants, on the better soils, were found growing



Fig. 4.—Small flowered Mallow (*Malva parviflora*) "Mollee," Narrabri.

in equal proportions. This medic may be distinguished from *Medicago denticulata* by its deeply notched leaf, and by the coils in the burr being less conspicuous. On the better class of soils the plant assumes an erect growth, but on lighter land it develops a more prostrate habit. Were it not for its burrs the plant would make excellent pasture.

Chemical analysis of a sample from Narrabri showed the plant to have a higher albuminoid ratio than a sample of *Medicago denticulata*, but that it was less fattening.

Another Burr Medic, at present very common in New South Wales, is *Medicago minima*, L. (Plate 2). It was found to be most plentiful on the North-western and Central-western Slopes, but scarce on the Southern

Tableland. *Medicago minima,* while thriving on the richer soils, also does well on the lighter sandy formations. The plant was found to almost monopolise the situation on a cleared portion of the Pilliga Scrub. (A striking example was afforded in this case of the remarkable improvement of scrub when cleared and freed from rabbits. Fig. 1.)

On both heavy and light soils the *Medicago minima* assumes a prostrate form, and in many instances makes a dense sward, providing plenty of feed. It appears to be readily eaten by stock. The plant may be distinguished from the other two Burr Medics by its woolly leaves and its more prostrate habit.

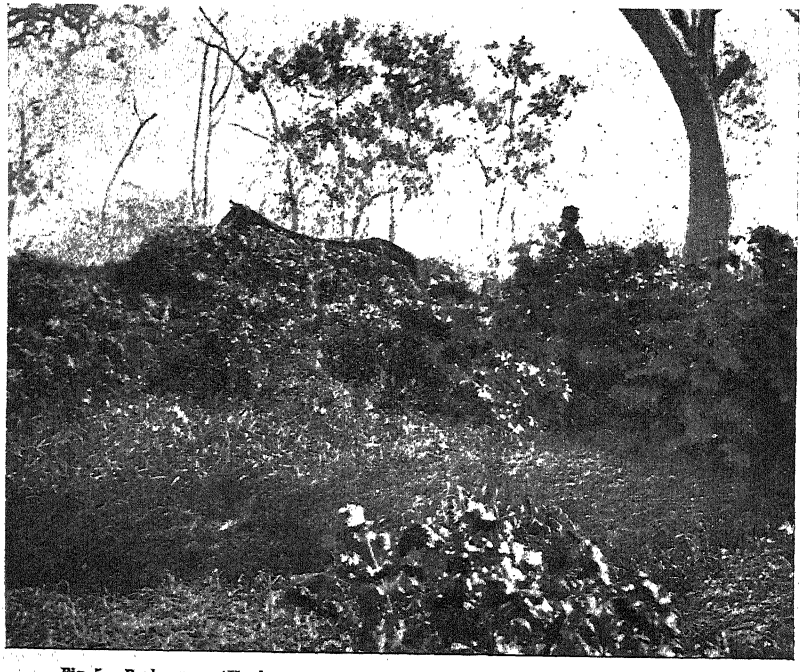
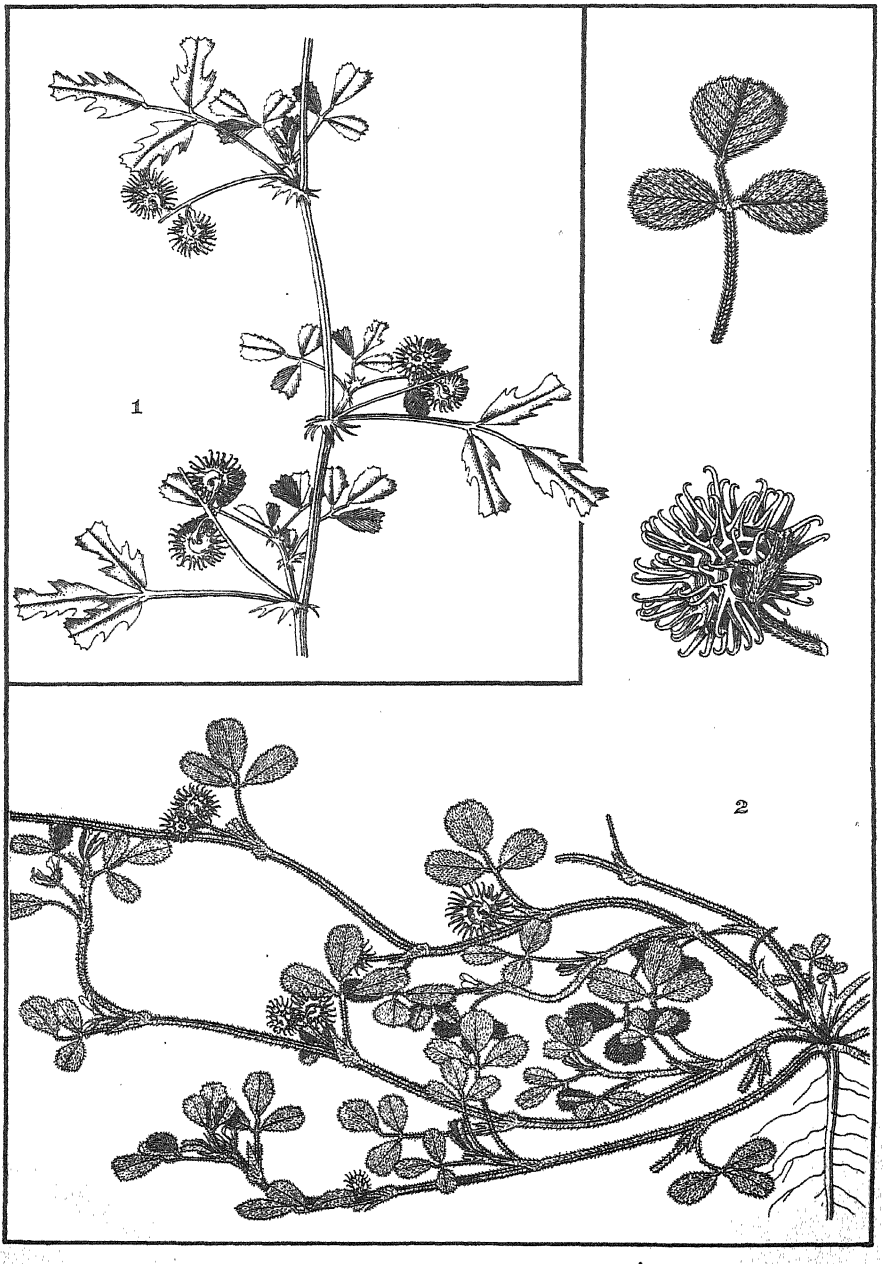


Fig. 5.—Barley grass (*Hordeum murinum*) and Mallow growing in association at Narrabri.

Crowfoot.

This is well known right throughout the whole of New South Wales. It is not a grass, but belongs to the same family as the garden Geranium. There are two Crowfoots growing in abundance at present, viz., *Erodium cygnorum* (Nees) and *E. cicutarium* (L'Hérit.). The former plant is a native, while the latter was originally derived from the Mediterranean countries of Europe, whence it has spread throughout all the continents.

Erodium cygnorum was found to be very common on the North-west Slopes. It is a favourite with pastoralists, being for obvious reasons an excellent forage plant for sheep. On the loose black or red soils it is not an uncommon sight to see it growing to a height of 6 feet. Given good



1 MEDICAGO LACINIATA, MILL.

2 MEDICAGO MINIMA.

late autumn rains the plant will thrive so well that in many places it dominates over all other herbage (Fig. 2). The plant is particularly adapted for propagation by its seed. This is sharp-pointed, and provided with an awn or spear. The awn is hygroscopic in character. Under the influence of dew or of rain the awns straighten themselves out, while on the approach of sunshine they curl up. These rotary movements enable the sharp-pointed seeds to be pressed firmly in the ground instead of being blown about by the wind.

Chemical analysis of a sample from Narrabri shows the plant to have a fair fodder value.

Erodium cicutarium (L'Hérit.).—This plant does not, as a rule, grow to the same height as *Erodium cygnorum,* and on the harder soils assumes a prostrate habit. It is particularly small and of a rosette character on the grass lands of Molong, Carcoar, Queanbeyan, and Yass.



Fig. 6.—Wallaby, or White Top grass (*Danthonia penicillata* var. *semiannularis*) at Carcoar.

This plant has earned a great reputation in certain parts of America, where it is called by several names, such as Alfilarea, filaree, pin clover, pin grass, and Heron's Bill. The plant in that country is considered to make good hay, and the seed is a marketable commodity.

Variegated Thistle.

Carduus marianus, L. (Variegated or Spotted Thistle).—The opinions concerning this plant are controversial. Some pastoralists look on it as a blessing, while others try to get rid of it. It appears, from the writer's own observations, that, where it exists in such abundance as to crowd out other herbage, as, for example, at Narrabri, Liverpool Plains, and Scone, pastoralists are content to take a falsely alluring rather than a critical view of the plant. An apology is made for its existence as being a good "stand-by." Now, it is true that stock can eat and thrive on it when it is dry,

but it is equally certain that while good herbage exists the plant is left alone. In many instances the writer had ocular evidence that the plant was left untouched. In one case, viz., a horse paddock, everything else was eaten out, and the thistles were just beginning to be eaten as "the last green thing left." (Fig. 3.)

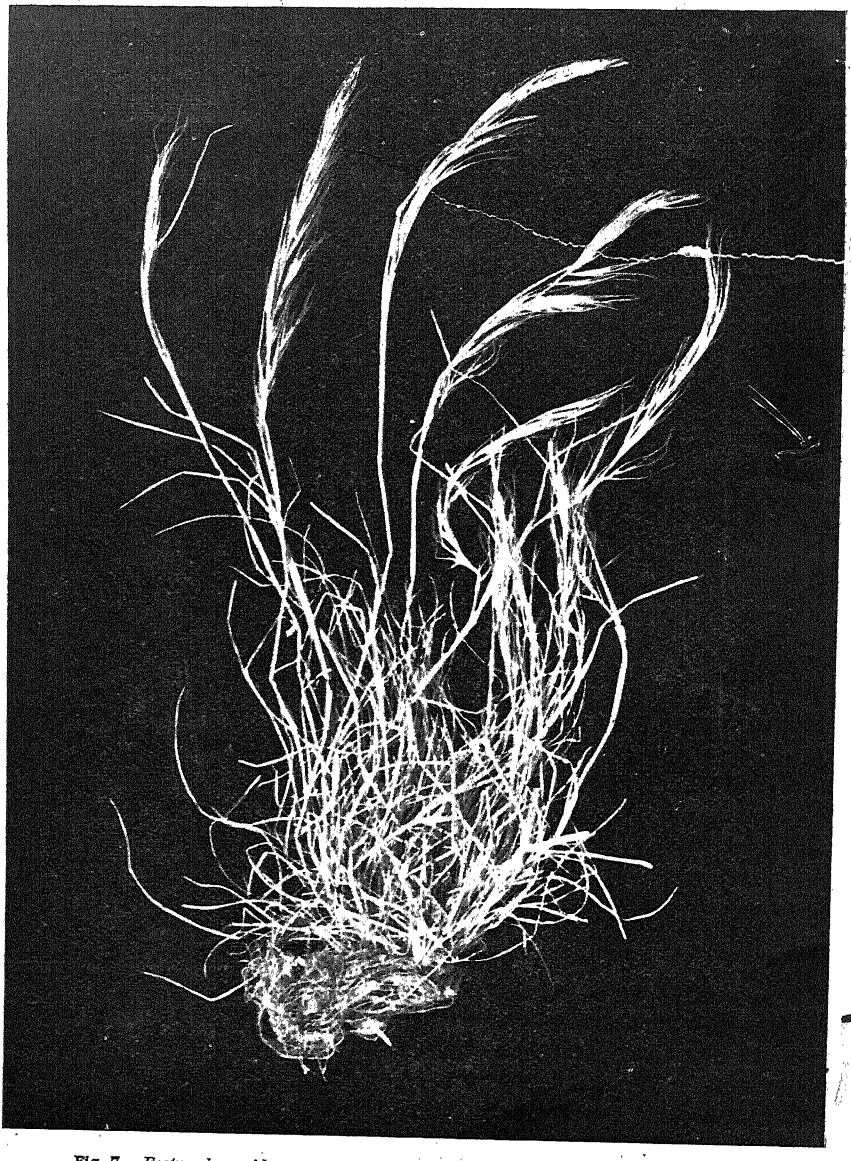


Fig. 7.—*Festuca bromoides*, a very common introduced grass, which thrives in the winter and spring months.

The plant thrives far too well on the loose black soils. In the Central West and the Southern Tableland, where the shallow soil is inimical to its growth, it occurs more sparingly, and in many such instances the thistle is considered a veritable pest.

Mallow.

Malva parviflora, L. (Small Flowered Mallow, wrongly called by most pastoralists "Marsh Mallow").—This plant is regarded in most situations, and rightly so, as a weed. It is very cosmopolitan in character, and can be seen thriving on waste lands, around old buildings, barns, &c. In such situations stock do not appear to eat it. In the north-west, however, as, for example, at Narrabri (Fig. 4), the plant attains a most succulent growth, and there is no doubt that under such conditions it is appreciated by stock.

Chemical analysis of a plant just at the flowering stage from Narrabri showed the plant to have a high nutritive value.

The plant is widely suspected of causing "staggers," particularly to working animals. Chemical analysis, however, fails to reveal anything of a poisonous nature. It is also attacked by a fungus, which, however, is considered by the Departmental Biologist to be harmless.

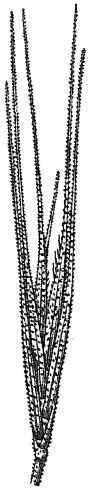


Fig. 7a.—Spikelet of *F. bromoides.*

"Grass" Country as distinguished from "Herbage" Country.

Roughly speaking, the country west of the tablelands may be considered herbage country in the winter months—*i.e.*, it carries plants practically exclusive of grasses. The grasses are very limited in quantity, and consist mainly of Barley grass (*Hordeum murinum*). The scope for Barley grass depends mainly on the rainfall in the autumn months. If the grass gets a start from an early rainfall it will become abundant (Fig. 5), otherwise it is ruled out by the herbage hitherto described.

On the tablelands and coast the herbage for the most part loses its luxuriant character, and, under favourable conditions, is replaced by a fine sward of grass. Such country can be seen at Scone, Molong, Gundagai, Yass, and Queanbeyan. What herbage does exist is of a small and prostrate character, and does not crowd out the grass. A calculation of plants on the Commonwealth territory at Queanbeyan showed the following average proportions:—

Festuca bromoides, 34 per cent.
Capsella Bursa-pastoris, 20 per cent.
Erodium cicutarium, 12 per cent.
Medicago denticulata, 20 per cent.
Danthonia penicillata, 10 per cent.
Plantago varia, 4 per cent.



Fig. 8.—Pure merino sheep at Vale View, Yass, on country carrying a close turf of *Danthonia semiannularis* and *Festuca bromoides* (principally).

Danthonia species (Wallaby or White Top grass), principally *Danthonia semiannularis* (Fig. 6) and *Festuca bromoides* (Fig. 7), together with Barley grass, are the prominent grasses. These grasses stand plenty of stocking, and can carry one to one and a half sheep per acre. Being shallow-rooted plants they can grow on the poorer formations, and thriving during the season when evaporation is not great, produce a fine green sward.

Herbage country is spoken of as good fattening country, but, speaking generally, it cannot be considered as permanent or as "standing" as grass country.



Fig. 9.—Recovery of Salt-bush country (*Atriplex nummularia* and *A. halimoides*) at Condobolin. This fine growth has resulted from excluding the sheep for three years.

The country around Yass carries a breed of sheep famous for its high-priced wool (Fig. 8). Such country during the last winter was carrying a remarkably fine sward of grass, principally *Danthonia semiannularis, Festuca bromoides,* and *Stipa semibarbata,* together with *Erodium cicutarium.* With an average rainfall this class of country presents a somewhat similar aspect all through the year, and can maintain a constant carrying capacity; whereas herbage country, as at Narrabri, can increase its carrying capacity in the winter months, but is probably forced to considerably decrease on this carrying capacity during the summer. Grass country again possesses a considerable advantage in having no burrs to deteriorate the wool. It appears also as if the grass country of the Central-western Slopes and of the Southern Tablelands is gradually becoming more adapted for sheep and less for cattle. The coarse-growing grasses, like Kangaroo grass (*Anthistiria ciliata*), Queensland Blue grass (*Andropogon sericeus*), are disappearing, and are being replaced by the finer-leaved grasses, like *Danthonia sp.* and *Chloris truncata* (Umbrella or Windmill grass).

Chemical Analysis of some Plants (from Narrabri).

Medicago denticulata, Willd.

	Per cent.	Calculated on plant dried at 100° C.
		per cent.
Moisture at 100° C.	19·85	.....
Ash	2·55	2·8
Ether extract	1·29	1·6
Fibre	4·08	5·09
Albuminoids	5·67	7·07
Carbohydrates	66·56	83·44

Nutritive value, 75·13; Albuminoid ratio, 1:12·2.

Medicago laciniata.

	Per cent.	Calculated on plant dried at 100° C.
		per cent.
Moisture at 100° C.	27·5	.....
Ash	2·94	4·05
Ether extract	1·75	2·41
Fibre	5·97	8·23
Albuminoids	6·56	9·04
Carbohydrates	55·28	76·27

Nutritive value, 65·78; Albuminoid ratio, 1:8·6.

Erodium cygnorum.

	Per cent.	Calculated on plant dried at 100° C.
		per cent.
Moisture at 100° C.	17·92	.....
Ash	4·00	4·87
Ether extract	1·01	1·23
Fibre	2·30	2·80
Albuminoids	7·00	8·52
Carbohydrates	67·77	82·58

Nutritive value, 77·04; Albuminoid ratio, 1:10.

Malva parviflora, Linn.

	Per cent.	Calculated on plant dried at 100° C.
		per cent.
Moisture at 100° C.	23·26	.....
Ash	1·98	2·58
Ether extract	·82	1 06
Fibre	3·12	4·07
Albuminoids	8·31	10·82
Carbohydrates	62·51	81·47

Nutritive value, 72·67 ; Albuminoid ratio, 1:7·7.

Remarks on above Analyses.

It must be borne in mind that the chemical composition of a food is only a partial guide to its feeding value. The nutriment contained in a plant depends on many factors, such as soil, stage of growth, climate, &c. Moreover, one must take into account the extent of the digestibility of each constituent of the food. Although a plant, for example, may contain a large amount of nitrogenous matter, only a percentage of this may be digestible.

The interpretation of analyses of fodder has already been given by Mr. F. B. Guthrie (*vide Agricultural Gazette*, Vol. 10, p. 1052).

It will be seen from the above analyses that Crowfoot (*Erodium cygnorum*) has the highest nutritive value (calculated by adding the carbohydrates, albuminoids and ether extract multiplied by 2¼, together). *Malva parviflora* (small flowered mallow) has the highest albuminoid ratio (the proportion of digestible albuminoid or nitrogenous compounds to the digestible carbohydrates or fats). *Medicago laciniata* contains more albuminous (muscle-making) food, but less carbohydrates (fattening foods) than *Medicago denticulata*.

Turning Pigs into Ripe Wheat to Fatten.

In reply to a query on this subject, Mr. G. Valder, Acting Under-Secretary and Director of Agriculture, stated:—It would be extremely wasteful to turn pigs into a ripe wheat crop, as a large quantity of the grain must inevitably be lost.

Wheat is, under normal market conditions, an economical food, and compares favourably with maize in its power to fatten. In all cases wheat gives better results when subjected to soaking for from eighteen to twenty-four hours. When soaking is practised, only the quantity the animal is likely to eat should be fed, as if it is left in the troughs for lengthened periods, fermentation sets in and renders this food unsuitable. Of course, wheat should be fed in moderation.

Sheep for the Murrumbidgee Irrigation Area.

J. WRENFORD MATHEWS.

With the settlement which is now fast taking place on the irrigation area at Yanco, the question of how best to utilise the land is engaging the attention of those concerned. Though there is never likely to be any concerted action in this direction, yet it is safe to deduce that, in the course of time, attention will be confined to those commodities which can be most economically produced. Apart from fruit-growing, for which special facilities are afforded, and which promises to become a most important industry, many advantages are offered in some of the more advanced departments of stock-raising. Dairying will undoubtedly largely engage the attention of the settler in the future. For the consumption of an abundance of fodder no class of live-stock can successfully compete with the dairy cow. She is quiet, contented, and docile, and can be conveniently managed on a small area. Moreover, she enables the rich succulent feed to be converted into highly profitable and marketable products. With her should always be associated the pig. Worked properly together, these two form an excellent combination.

Possibilities of the Sheep Industry.

Recently a settler applied to the Department for information concerning the possibilities of sheep-raising, hence this brief summary.

Hitherto sheep-raising has not received very favourable consideration by the intending settler, nor can we wonder at it, considering the size of the areas, and the high cost of production. Under such circumstances, can it be made profitable? The general impression is that it cannot. The rent is high, and the area too small to enable a sufficient number of sheep to be kept to recompense for the outlay.

In the absence of records of any work ever having been attempted under similar circumstances, we cannot definitely state whether sheep-raising, even in its most intensive aspect, can be made to pay. As a separate industry it certainly does not appear to hold out the same inducements as either dairying or pig-raising. Sheep require more room and cannot be raised in close confinement, like these classes of live-stock. Whilst probably the idea will never be seriously entertained on the 50-acre blocks, sheep-raising may, nevertheless, yet become an important branch as a side line, provided additional room can be secured. It is difficult to state the area required to supplement the small irrigable blocks, but it is estimated that an additional area of at least 150 acres would be necessary for this purpose.

Feeding the Sheep.

The necessity of providing this additional area becomes all the more apparent when it is explained that under all systems of feeding, sheep require

a frequent change of diet. The rich and abundant food supply must be supplemented with poorer pasturage. If fed continually on the one kind of pasture, sheep are apt to sicken; a change of diet is, therefore, not only beneficial, but an absolute necessity under all such systems of feeding. Besides this, they should be afforded ample space in which to take daily exercise in order to keep themselves in a healthy condition. Moreover, to run a flock on a small section continually, would probably result in their treading down more feed than that consumed.

Our correspondent writes favouring the growing of fodder and fattening in the pens. This means that the feed would have to be gathered and hand served to the sheep. We are not impressed with the practicability of this suggestion. Though often resorted to during periods of drought, our experience is that it is unsatisfactory and wasteful in the extreme. While hand-feeding may be profitably applied to the feeding of dairy stock, it will not answer in the case of sheep. For ewes not rearing lambs, and when food is scarce on the dry area, it may pay to do a little hand-feeding in order to keep them in condition, but not for fattening. Moreover, it is well known to the general run of sheep breeders that sheep prefer to pick their own food. Of all classes of stock they are, perhaps, the most fastidious in their choice of pasture. While they relish what they crop for themselves, unless starved into eating food which is not quite to their liking, they will pass over that which has been gathered for them. The only practical way, therefore, of utilising the fodder given would be to have the supply made available in small areas, and to feed off each section alternately. The size of the subdivision will depend on the amount of fodder grown and the number of sheep placed upon it at any particular time. As one section is fed off the sheep will have to be removed and placed in another. The class of fodder grown should also be considered. To obtain the best results from this method of feeding, the sheep should be afforded a change of diet. Rape is, perhaps, the best class of fodder for early fattening, but rape supplemented with another class of fodder gives better results than when rape is fed by itself. Excellent results have been obtained from a combination of rape and barley, especially for ewes and lambs. The barley furnishes the ewe with an abundance of milk, and rape assists in fattening both ewes and lambs. If lucerne is fed in combination, so much the better. Not only does it assist in balancing the ration, but retains also the property of hardening the flesh. Should hand-feeding take any part in the practice, lucerne will undoubtedly be found the most profitable class of fodder with which to hand-feed.

Lamb-raising *versus* Store Stock.

The class of sheep is a most important factor in deciding the undertaking. In all such operations there must be an objective. The intending sheep-farmer will require to have his plans before him, and to know exactly his ultimate aim. Besides a clear and definite idea as to how he will accommodate his stock, he must decide what particular market he will cater for,

and whether he will be a breeder or a dealer. In this connection two courses appear open: either he may direct his attention to the buying in of store stock at favourable opportunities, with the object of fattening and then disposing of them, or he may adopt a set line of breeding with a view to raising early lambs suitable for the export market. Certainly there are no branches of the industry from which there can be obtained a quicker return, or which would show a greater margin of profit for the amount invested. They both have their advantages, and once having grasped the potentialities of these alternatives, the intending sheep-farmer must decide for himself which course to pursue.

In the former case, the amount of profit to be derived is largely dependent upon the price at which the store can be obtained, and this in turn is mainly a matter of ability to "drive a bargain." With the disposal of the stock, however, all responsibility and expense ceases, whereas in the latter case, although it is believed that an increased return would be obtained, the ewes forming his breeding stock will have to be accommodated from year to year. In order to illustrate the amount of profit likely to be derived, we may here institute a comparison.

The wethers purchased off shears, or at any other favourable opportunity, and in good store condition, would, as a result of three to four months' feeding, yield a margin of profit in wool and mutton of, say, about 8s. On the other hand, a lamb bred on the right lines, and fattened off its mother, would, at the age of four or five months, give a return of 12s. to 13s. In this latter case, there must be also taken into account the value of the wool yielded by the mother for the year. Calculating on present values there should be a return of about 7s. worth of wool, and this, together with the price of the lamb, would make an approximate return of £1 for the year. The estimate would only vary according to the fluctuations of the wool market. It should, however, be observed that whilst a return of about 13s. would be obtained for the carcase at four or five months, yet it takes twelve months to produce the 7s. worth of wool.

Carrying Capacity of the Area.

The number of stock that the area would be capable of carrying would largely depend upon the quantity of feed grown on (*a*) the irrigable block, and (*b*) the grazing area.

In view of there being no records available to show what is possible with these intense methods of feeding, it is very difficult to estimate the carrying capacity of the area. An approximate estimate may, however, be arrived at by taking the number the dry area of 150 acres would support separately, and adding thereto the additional number that the irrigation block should carry.

The average grazing land in the Riverina can carry a sheep to the acre; this usually implies an average class of Merino, but where cross-breds are concerned, the carrying capacity is somewhat reduced; it may be calculated at two sheep to 3 acres. Worked out on this basis, the whole area, comprising 150 acres of dry land and 50 acres of irrigable land, should be capable of carrying 300 ewes and rearing their lambs.

The estimated increase from these ewes is set down at 80 per cent. Assuming then that the ewes would yield such an increase, this would mean that from the time the lambs are dropped until they are disposed of as fats, the 200 acres would be carrying 540 sheep. In addition there would be six rams, which would be required for breeding purposes.

Obviously, the same number of wethers as ewes could be carried.

Necessary Outlay and Possible Returns.

The amount of profit yielded from the wethers would naturally vary according to the price paid for them, as well as the length of time they would be required to be kept.

In the case of the raising of export lambs, the proceeds from the year's work would probably be about £260. It should be borne in mind that, once relieved of their fleece, the ewes could be accommodated on the dry area, and, therefore, the irrigable lands could be utilised for other purposes for a considerable portion of the year.

The cost of the ewe would naturally vary according to age and class. It would be unwise, however, to purchase old ewes for the purpose indicated, as not only would they yield a relatively lower value fleece, but it would, perhaps be necessary to replace them after a couple of years. In effecting a purchase, the settler should aim at obtaining good young ewes which would produce a profitable fleece. Suitable ewes would cost about 15s. each at 18 months of age. Allowing 2 per cent. of rams for the ewes, Dorset Horn rams would cost £18 18s., *i.e.*, £200 would be required with which to purchase stock. From the gross proceeds there must be deducted working expenses, plant, depreciation, rent, &c., which the farmer might work out on his own account.

Selection of Breeding Stock.

It will now be necessary to indicate the most suitable class of ewe for this purpose. What is required is an ewe that will respond to feeding, mature early, and produce a good fleece. For this purpose, the Merino is entirely unsuitable, and a cross-bred ewe, Lincoln x Merino preferred, is recommended for the purpose. In view of early maturity being the greatest desideratum, the Dorset Horn is strongly recommended as the most suitable breed to mate with the ewes. The Department's cross-breeding experiments conducted over a series of years have abundantly proved the value of this combination for the purpose indicated.

Period of Lambing.

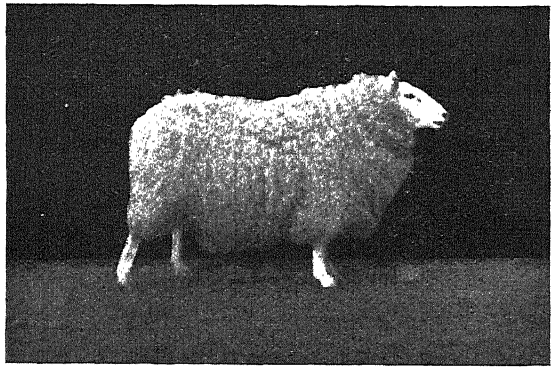
The period of lambing, and an efficient food supply, should be fixed with due regard to the time at which the lambs could be most profitably marketed. The facilities afforded at Yanco would enable the lambs to be got off earlier than from other districts, and this offers special inducements. The market could be exploited with the first of the season's drop, and high prices realised in consequence. The rams should be put with the ewes in the latter part of October. Allowing five months as the period of gestation, the lambs would be dropped in March, and marketed in August, about ten months from the time of mating.

Cheviot Sheep at Glen Innes Experiment Farm.

E. A. ELLIOTT, Junior Assistant, Sheep Breeding Experiments.

THE Cheviot breed of sheep, as the name implies, comes from the mountainous districts on the border of England and Scotland. It belongs to the Longwool group, the fleece growing to a length of about 6 inches. In texture the wool is finer than the other Longwools, but is inclined to be straight in the lock, deficient in character, and rather light in condition.

The breed is deep and and long bodied, fine boned, and well proportioned, and has no wool on the face or legs.



Cheviot ram, bred at Glen Innes.

In England the Cheviot is noted because it mates very well with the English Leicester, the Border Leicester originating in this way.

In July, 1910, three ewes and one ram of this breed were brought to this farm. It was thought that the New England climate more nearly approached the conditions prevalent among the Cheviot Hills than any other climate in New South Wales.

Previous to this they were tried at Wagga Farm, but the conditions there were too hot and dry, and the sheep did not thrive. After being here for three years, one can safely say that the existing conditions are favourable to the Cheviot breed.

This sheep does well on the natural pastures all the year round when another breed or cross-breed will not. Proof of this was obtained here in the winter of 1912, when, owing to the severity of the winter, hand feeding had to be carried out for a period of four months. At the end of that time the main flock was only in fair condition, while the Cheviots were fat, although

they did not touch the artificial feed at any time during the winter. They also seem to be more immune from both stomach and lung worms than other sheep. It can seen by this that the Cheviot is a very hardy breed.



Group of Cheviot ewes.

The breed is little known in Australia, and for crossing purposes with the Merino it does not compare favourably with some of the other Longwools. Also by crossing it tends to lose its wonderful constitution to a certain extent. It is therefore advisable to use it in its pure state.



Cheviot ewes and rams, showing the young stock.

In view of its hardiness and the ability it has shown on this Farm for thriving on rough and scanty pastures, it should prove suitable for stocking some of our cold and mountainous districts.

Dairy Science School at Singleton.

The recent Dairy Science School held at Singleton was a distinct success, and eight certificates were issued to students who showed proficiency in cream grading, cream testing, or both. The school was conducted at the Singleton Central Butter Factory. The course was made available for factory managers, assistant managers, and cream graders, and representatives of the following factories were successful in gaining certificates:—Singleton (2), Gloucester, Scone, Wingham, Paterson, Taree, and Hinton.

Fourth Annual Report of the Demonstration Area, Bathurst Experiment Farm, 1912.

R. W. PEACOCK, Manager.

I HAVE pleasure in submitting the Fourth Annual Report of the Demonstration Area of this Farm.

A profit is again shown, viz., 13s. 10d. per acre.

The profits for the past four years have been as follow :—

Year.	Profit per acre.
1909	£1 8 8¼
1910	1 3 3
1911	1 18 3
1912	0 13 10

The profit is the smallest yet shown, and the season proved such that a farmer should have been satisfied to have held his own rather than to add to his banking account. The prices received for much of the produce were much lower than during the previous year, and were based upon the prices ruling each month, as the produce was disposed of. The high prices ruling for horse fodder during the preparation for, and the harvesting of the crop, coupled with the increase in wages, increased the cost of production considerably. Such advance will be seen when this report is compared with the previous one. Besides the profit shown, it should be borne in mind that if the work had been performed by a farmer and his sons they would have received, in addition, full wages at the higher rate for all the work they performed, which would represent a living.

As an offset against an increase in wages, farmers should consider the question of larger implements in reducing the cost of production. Upon a small area as the one under review, this aspect is not of such vital importance, especially when the practical education of students forms a part of the scheme. As sufficient data were available during past years as to the cost of the various operations, it was not deemed expedient to keep the man and a student to do the most of the work, and frequently most of it was carried out by students alone, upon which a correct value could not be placed. Statement No. 1, therefore, is based as regards expenditure upon the increased rates given below, which are certainly in excess of what the work should reasonably have been done for. The receipts are correct in every particular. The returns from agistment have been valued upon a somewhat different basis than during previous years. The increases in the prices of sheep and wool warrant an increase in the earning power of a ewe per year : this is therefore calculated at 12s.

The value of the green succulent fodder, as provided by the fodder crops throughout the extreme droughty conditions, would be far in excess of the same during ordinary years, and is difficult to compute.

As during 1911, the results have been presented in three different ways, viz. :—

Statement No. 1—the expenditure based on current local rates, and actual receipts as during previous years, showing the profit as above.

Statement No. 2—a statement based upon the average local rates for the work done, the produce sold at local milling rates, and the value of the fodder crops estimated to cover the cost of their production only, the profits on this basis being 7s. 7d. per acre.

Statement No. 3 is also based upon local rates, plus cost of grading seed, &c., and the seed sold as pure seed to farmers. In this case the profit is 18s. 3d. per acre.

The system of crop rotation followed is the same as during previous years, it being a two-course one, a fodder crop for sheep alternating with main cereal crops.

This system allows of a five months' bare fallow, from November to April, such having proved essential for obtaining the best results. Rent at 8s. 4d. per acre for the arable area is charged.

Notes on the season, together with a tabulated statement of the operations, are given. For fuller particulars respecting this area, readers are referred to the previous reports.

Notes upon Season.

Throughout the season many of the conditions were decidedly abnormal, the main features being an exceptionally dry autumn, which precluded the satisfactory growth of the fodder crops and the germination of the main cereal crops until far beyond the season best calculated to give the best results.

The droughty conditions were broken on the 9th June, and were followed by continuous winter rains, 10·22 inches falling during the coldest months of the year, June, July, and August. These had the effect of waterlogging the soil and keeping the soil too cold for the satisfactory growth of the wheat crops.

The conditions were better suited to the oats and barley crops, from which more satisfactory returns were received.

The outstanding features were: a very dry autumn, an excessively wet period directly after the drought broke, causing much of the land to set too firmly for best results, and insufficient rains during November and December. The distribution of the 17-inch rainfall was anything but satisfactory.

Owing to the consolidation of the soil, it was deemed advisable to harrow some of the crops. This operation had been previously omitted upon this area. The results from the practice throughout this season were not decisive, due perhaps to the fact that the crops upon the fallowed land did not suffer for the want of moisture.

Manuring.

The manurial practice was similar to that of previous years, viz., the application of 56 lb. of superphosphate to the fodder crop the preceding year, and 30 lb. with the wheat at seeding time upon the lighter lands, the richest portions being left unmanured. Check strips were left for comparison, and the manuring gave an average increase of 5½ bushels per acre over the unmanured. This amount represented an increase of 36 per cent.

Varieties.

The three main varieties recommended for the district are Cleveland for early, Federation for mid-season, and Bobs for late sowings. Other than these were sown upon the area this year, not because they were thought better, but because seed of them was required by the Department and other farmers.

The three recommended more than held their own. Although Federation is credited with the highest yield, viz., 26 bushels 57 lb., the paddock in which it was grown was not comparable with the others. Where fairly reasonable comparisons were possible Bobs topped the yield with 26⅔ bushels, Cleveland came next, followed by Federation. Thew was badly cut by frost, which materially reduced the yields.

The wheat yields were unquestionably disappointing, considering the moisture conserved, as compared with other years.

The average of all the wheat grown on the area was 19⅓ bushels.

A table showing the details of the operations and individual yields, together with a more detailed report, was published in the *Agricultural Gazette* for April, 1913.

The charges for the various operations have been fixed as follows :—

Six-inch ploughing	8s. per acre.
Four-inch ploughing	4s. 6d. ,,
Harrowing	1s. ,,
Drilling	2s. 3d. ,,
Seed wheat	6s. per bushel.
,, barley	5s. ,,
,, rape	3d. per lb.
,, oats	3s. 6d. per bushel.
Superphosphate	£3 14s. per ton.
Cutting with binder	4s. per acre.
Twine...	1s. 6d. ,,
Stooking	1s. 6d. ,,
Carting and stacking	7s. 6d. ,,
Threshing	5½d. per bushel.
Bags and twine	2d. ,,
Rent per annum	8s. 4d. per acre.

In Statement 1 the produce is credited at seed wheat and current market rates. The prices, other than for seed, are based on the local prices obtaining at the time of sale or transfer.

Rent is charged on the paddocks under main cereal crops for a period of sixteen months, and on those under fodder crops for eight months.

Paddock No. 1.

Algerian Oats for Hay and Grain. Area, 14·32 acres.

Statement 1.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Six-inch ploughing	5	14	6	Oats—			
Two 4-inch ploughings ...	6	8	10	155 bushels, at 3s. 6d. ..	27	2	6
Drilling	1	12	2	7½ ,, 3s.	1	2	6
Seed	2	12	10	Hay—			
Superphosphate	0	14	10	t. c. q. lb. £ s. d.			
Treating seed	0	5	0	1 17 3 7 at 3 1 0	5	15	3
Cutting with binder	2	17	3	1 12 2 0 ,, 2 8 6	3	18	9½
Twine	1	1	6	5 0 0 0 ,, 2 11 0	12	15	0
Stooking	1	1	6	13 12 3 27 ,, 2 4 0	30	0	7½
Carting and stacking	5	7	5	0 7 2 0 ,, 2 0 0	0	15	0
Threshing	3	14	5	Straw—			
Ploughing round stack ...	0	3	3	4 10 2 14 ,, 1 10 0	6	15	11
Covering stack	0	4	4½				
Bags	1	7	1				
Cartage to rail	0	6	9				
Rent	7	19	1				
Burning weeds...	0	4	5½				
Cartage to barn	0	4	6				
Recleaning and grading ...	1	3	0				
Balance	45	2	10				
	£88	5	7		£88	5	7

Statement 2.—The cost of production, less that of cleaning and grading and removing strange plants, was £41 10s. 9½d., and the return at current market rates was £84 8s. 1d., leaving a profit of £42 17s. 3½d.

Paddock No. 1a.

Barleys—Cape, Skinless and Standwell Malting. Area, 7·19 acres.

Statement 1.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Six-inch ploughing	2	17	6	Yields—			
Two 4-inch ploughings ...	3	4	8	Cape—			
Drilling	0	16	2	bus. lb. s. d.			
Seed	1	6	0	165 38 at 5 0... ...	41	8	9
Treating seed	0	3	0	6 47 ,, 4 0	1	7	9
Superphosphate	0	7	5	8 34 ,, 3 6	1	10	4
Cutting with binder	1	8	9	7 0 ,, 3 3... ...	1	2	9
Twine	0	10	9	Standwell—			
Stooking...	0	10	9	37 20 ,, 5 0... ...	9	7	0
Carting and stacking	2	13	11	71 0 ,, 4 0	14	4	0
Threshing	7	9	5	3 0 ,, 3 3... ...	0	9	9
Bags and twine	2	14	4	1 27 ,, 3 0... ...	0	4	7
Rent	5	6	7	Skinless—			
Pulling strangers	0	15	10½	22 0 ,, 5 0... ...	5	10	0
Cartage to barn...	0	9	1	2 28 ,, 3 0... ...	0	7	8
Recleaning and grading ...	3	6	6½	Straw—2 tons 6 cwt. 2 qrs.,			
Balance	45	1	7	at £1 10s.	3	9	9
	£79	2	4		£79	2	4

Statement 2.—The cost of production, less that of cleaning and grading, &c., was £29 9s. 3d., and the return, at ordinary rates of 3s. per bushel, was £52 7s. 11d., leaving a profit of £22 18s. 8d.

Paddock No. 2.

Wheat. Area, 30·97 acres.

Dr. *Statement* 1. *Cr.*

	£	s.	d.
Six-inch ploughing	12	7	9
Two four-inch ploughings ...	13	18	9
Drilling	3	9	8
Seed	4	11	3
Treating seed	0	8	0
Superphosphate	1	1	3
Harrowing 30 acres	1	10	0
Cutting with binder	6	3	10
Twine	2	6	5
Stooking	2	6	5
Carting and stacking	11	12	3
Threshing	9	14	1
Bags and twine...	3	10	7
Rent	17	4	1
Pulling strangers	1	9	6
Cartage to barn	0	11	9
Recleaning and grading ...	3	13	2
Balance	34	19	5
	£130	18	2

Yields.

Wheat—

bus.	lb.		s.	d.	£	s.	d.
333	35	at	6	0 ...	100	1	6
4	0	,,	5	0 ...	1	0	0
64	30	,,	3	3 ...	10	9	9
7	45	,,	3	0 ...	1	3	2
2	8	,,	2	9 ...	0	5	10
11	32	,,	2	0 ...	1	3	1

Hay—

2 tons 8 cwt. 1 qr. 27 lb. at £2 1s.	4	19	5
Straw—			
7 tons 2 cwt. 2 qrs. at £1 10s.	10	13	9
Agistment	1	1	8
	£130	18	2

Statement 2.—The cost of production under ordinary farming conditions was £90 4s. 4d., and the return, at milling rates of 3s. 3d. per bushel, was £85 11s. 2d., showing a loss of £4 13s. 2d.

Paddock No. 2a.

Wheat for Hay and Grain. Area, 15·36 acres.

Dr. *Statement* 1. *Cr.*

	£	s.	d.
Six-inch ploughing	6	2	10
Two four-inch ploughings ...	6	18	3
Drilling	1	14	7
Treating seed	0	6	0
Seed wheat	2	3	3
Superphosphate	0	11	1
Resowing	0	19	1
Superphosphate	0	6	6
Seed	0	13	10
Harrowing	0	15	4
Cutting with binder	3	1	5
Twine	1	3	0
Stooking	1	3	0
Carting and stacking	5	15	2
Threshing	1	6	8
Bags and twine...	0	9	8
Rent	8	10	8
Pulling strangers	0	10	5
Cartage to barn	0	1	7½
Recleaning and grading ...	0	9	10
Balance	0	19	0½
	£44	1	3

	£	s.	d.
Agistment	1	5	11
Wheat—			

bus.	lb.		s.	d.	£	s.	d.
52	50	,,	6	0 ...	15	17	0
4	10	,,	3	3 ...	0	13	5½
0	34	,,	3	0 ...	0	1	8½
0	10	,,	2	9 ...	0	0	5½
0	27	,,	2	0 ...	0	0	11

Hay—			
12 tons 2 cwt. 1 qr. 24 lb. at £2 1s....	24	17	0½
Straw—			
16 cwt. 2 qrs. at £1 10s....	1	4	9
	£44	1	3

Statement 2.—The cost of production was £42 0s. 4d., and the total return, at milling rates of 3s. 3d. per bushel, was £36 16s. 9d., showing a loss of £5 3s. 7d.

Paddock No. 5.

Fodder crop. Area, 10·39 acres.

Statement 1.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Two four-inch ploughings ...	4	13	6	Agistment—			
Drilling	1	3	4	1·70 sheep per acre for five months—estimated value, 8s. 6d. per acre	4	8	3
Seed	2	3	10				
Superphosphate	0	18	6				
Rent	2	17	8	Balance...	7	8	7
	£11	16	10		£11	16	10

Statement 2.—On the assumption that the agistment should be charged at cost of production, this account should balance.

Paddock No. 6.

Fodder crop. Area, 24·90 acres.

Statement 1.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Four-inch ploughing	5	12	0	Agistment—			
Drilling	2	16	0	0·50 sheep per acre for five months—estimated value, 2s. 6d. per acre...	3	2	3
Seed	4	2	1				
Superphosphate	1	18	11				
Rent	6	18	4	Balance	18	5	1
	£21	7	4		£21	7	4

Statement 2.—This account also balances.

Paddock No. 10.

Wheat. Area, 10·2 acres.

Statement 1.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Six-inch ploughing	4	1	7	Agistment	0	19	1½
Two 4-inch ploughings ...	4	11	10	Wheat—			
Drilling	1	2	11	bus. lb. s. d.			
Seed	1	10	10	211 0 at 6 0	63	6	0
Superphosphate	0	11	2	29 24 ,, 3 3	4	15	7
Harrowing	0	10	2	6 16 ,, 3 0	0	18	10
Cutting with binder	2	0	9	1 0 ,, 2 9	0	2	9
Twine	0	15	3	3 58 ,, 2 0	0	7	11
Stooking	0	15	3	Straw—			
Carting and stacking	3	16	6	2 tons 11 cwt., at 30s. ...	3	16	6
Threshing	5	15	4				
Bags and twine	2	1	11				
Rent	5	13	4				
Pulling strangers	0	13	10½				
Cartage to barn	0	7	0				
Recleaning and grading ...	1	4	3				
Balance	38	14	9				
	£74	6	8½		£74	6	8½

Statement 2.—The cost of production was £33 6s. 10d., and the return at milling rates of 3s. 3d. per bushel was £45 13s. 4½d., showing a profit of £12 6s. 6½d.

Paddock No. 11.

Fodder crop. Area, 31·32 acres.

Dr. *Statement* 1. *Cr.*

	£ s. d.		£ s. d.
Four-inch ploughing	7 0 11	Agistment—	
Drilling	3 10 5	1·90 sheep per acre for five months—estimated value, 9s. 6d. per acre	14 17 6
Seed	4 17 0		
Superphosphate	2 11 10		
Rent	8 14 0	Balance	11 16 8
	£26 14 2		£26 14 2

Statement 2.—On the assumption that the agistment should be charged at cost of production this account balances.

Paddock No. 12.

Fodder crop. Area, 28·25 acres.

Dr. *Statement* 1. *Cr.*

	£ s. d.		£ s. d.
Four-inch ploughing	6 7 1	Agistment—	
Drilling	3 3 7	3·18 sheep per acre for five months—estimated value, 16s. per acre	22 12 0
Seed	5 9 1		
Superphosphate	2 9 11		
Rent	7 16 11	Balance	2 14 7
	£25 6 7		£25 6 7

Statement 2.—This account also balances.

Summary of Profit and Loss under Statement 1.

Paddock.	Profit.	Loss.
	£ s. d.	£ s. d.
No. 1	45 2 10	.....
,, 1A	45 1 7	.....
,, 2	34 19 5	.....
,, 2A	0 19 0½	.....
,, 5	.....	7 8 7
,, 6	.....	18 5 1
,, 10	38 14 9	.....
,, 11	....	11 16 8
,, 12	....	2 14 7
Balance, Net Profit	.....	124 12 8½
£	164 17 7½	164 17 7½

Profit per acre for whole area, 13s. 9½d.

Summary of Profit and Loss under Statement 2.

Paddock.	Profit.	Loss.
	£ s. d.	£ s. d.
No. 1	42 17 3½	.....
,, 1A	22 18 8	....
,, 2A	.....	4 13 2
,, 5	... .	5 3 7
,, 10	12 6 6½	.....
Balance, Net Profit	.....	68 5 9
£	78 2 6	78 2 6

Profit per acre for whole area, 7s. 7d.

Statement No. 3.

In this the charges and credits, so far as the main cereal crops are concerned, are the same as in Statement No. 1.

The fodder crops, however, are valued for agistment purposes at the cost of their production.

For details of operations, credits, &c., see Statement No. 1.

	Profit.
Paddock No. 1	£45 2 10
,, ,, 1A	45 1 7
,, ,, 2	34 19 5
,, ,, 2A	0 19 0½
,, ,, 10	38 14 9
	£164 17 7½

Profit per acre for whole area, 18s. 3d.

A Suggestion for New South Wales.

For about five months in late autumn and winter, water is accumulated in the reservoir formed by the Great Assouan Dam in Egypt, but a considerable amount is allowed to pass the sluices. It is understood that the Irrigation Department proposes to utilise this overflow to drive turbines connected with dynamos, and in time it is hoped to develop 150,000 horse-power. The electric energy generated is to be employed in the production of chemical fertilisers, by the fixation of atmospheric nitrogen. Last year alone no less than £650,000 was spent on such fertilisers.

Improving the Quality of Butter.*

M. A. O'CALLAGHAN.

We cannot but admit that during the last six months the most discussed question in connection with the Australian dairying industry has been the question of the low quality and the low prices which have obtained for butter shipped to the United Kingdom. I do not suggest that the State of New South Wales has been any worse in this respect than the other States—I have no figures which would enable me to say that. But we have sufficient data to show that the quality of our butter exported this season was not so good as that sent away last year. Not only have the farmers of this State suffered from a bad season throughout the greater portion of the dairying district, and a resulting diminished cream production, but also from the inferior priced butter shipped to England. As a consequence low prices have prevailed on the local market. Looking at it from the farmers' point of view, where is this state of things going to lead? Attention must be given to this question, not only by the farmers, but by every man who has the welfare of the country at heart. We must not submit to retrogression in this industry. Our competitors are making progress; the greatest competitor that Australia has to face, as a modern factor, is Siberia. We know that Danish competition has practically attained its maximum, and we know the limitations of the European competition, but there is no limit in sight to butter production in Siberia, and the Siberians are materially improving their quality. Certainly, the Siberian butter is not placed on the market at the same time as ours, but if they make the quality sufficiently good they will be able to store it, and this will, undoubtedly, be a big factor in the way of lowering the price of Australia's butter. Then the point is this, even if we do make butter as good as in previous years that will not be enough, we must have improvement. When I say this is a national question, I want to merely point to the fact upon which we are all agreed, viz., that the primary industries of the country, and especially this one which so largely encourages closer settlement, are industries upon which a large portion of the population of Australia is dependent. Now, if a large population is not encouraged, what is going to happen in, say, fifty years' time? What is the destiny of our nation? Dairying is one of those industries which result in a population of greater density than, I suppose, most of the other rural industries. There are more people on the land in the closer settled dairying districts than anywhere else in the State. Therefore, I say, the future of dairying is a national question.

The farmer is also faced to-day with another important factor to be considered in connection with this industry, a condition of things which

* Address given at the Eighth Annual Conference of the Co-operative Dairy Factory Managers and Secretaries' Association on Thursday, 26th June, 1913.

must affect every man in Australia, namely, the high cost of living. No matter whether it is the man who milks the cows or the farmer himself, he has to meet the rapidly increasing cost of living, and therefore, if our industries fail to return an increasing profit, they will cease to be as remunerative as they were Because living has become dearer there must necessarily be an increase in wages paid either in cash or by the farmer himself for his own labour. All these things affect the profits of the farmer, and as soon as dairying ceases to be profitable then the factory managers' position will become insecure. Surely this state of things is one which affects every individual here, as well as affecting the general community.

There are two things which each one must take into consideration in order to see where he stands :—

First, what is the cause of the inferiority in the butter produced ; and,

Second, what is the cause of the reduction in the prices realised?

There is no gainsaying the fact that factory managers can assist the farmers by checking the increasing tendency towards supplying inferior cream. The factory manager is concerned very closely with—I might say he is responsible for—the quality of nine-tenths of the cream delivered at his factory. Great responsibility rests with the factory manager, as he controls, to a great extent, the quality of the cream supplied. There may be instances where he has not the power to take a stand which would enable him to bar the production and sale of bad cream in his district, but if the manager is sufficiently strong he will very largely command the quality of the cream produced in his district. We have known managers, having the necessary strength behind them, to compel the delivery of only good cream to their factories.

There is no doubt but that the cause of the inferior butter is the low grade of cream supplied. Our manufacture may have deteriorated in some cases. I understand from the judge of the butter competitions that butter had decreased in quality as compared with that of last year's exhibition. It is not so very difficult to keep farmers up to the standard, but once let suppliers become lax in their habits of cleanliness, &c., and unable to deliver first class cream, and you will have great difficulty in bringing them up to the mark again. Cream is now being supplied of a lower quality than it was twelve months or two years ago. I think we are all capable of seeing what this small decrease in quality in individual cases means. It is this small decrease that is so important; a manager who gets 70 per cent. good cream one year, and who may have got only 60 per cent. last year, would think that because it did not affect him very much it was not of very great importance. It is only people here in Sydney who see all the butters exported who can realise what the joint effect of this gradual inferiority in the quality of the cream supplied really means. I am strongly of opinion that the position should be fully discussed, and all the causes of inferior cream classified, so that the factory managers can take combined action and compel the stricter grading of cream supplied to their factories. If the manager grades his cream supply strictly, and pays the farmer according to

the quality, the farmer will respond in nineteen cases out of twenty; but so long as the farmer is paid top price for his cream, irrespective of whether it is first or second grade, so long will he neglect to make any improvement.

The Minister gave you an opportunity of discussing the main clauses of the Bill which he is preparing. The clauses of that Bill embody the resolutions of the Committee appointed by your Association last year, and which were carried by that Committee. What I would like you to discuss, and focus your attention on, however, is the question:—"How are you going to overcome the retrograde position into which we have been forced during the last twelve months?" There is no doubt that some of the inferiority was due to the season; but we cannot shelve the main trouble any longer. We must, gentlemen, admit that a crisis has been reached in this industry, and that it is necessary for factory managers to say,—"Will they compel the grading of the cream at the factories governed by them, and will they pay for that cream according to the grade at which it has been classified?" It may be possible to do this in two ways. It may be done by completing the system of co-operation amongst farmers, and it may be brought about by legislative means.

Since the last conference you have had a year's further experience. As already suggested, the responsibility is yours to a very large extent. When I say that by complete co-operation it would be possible for factory managers to be in a position sufficiently strong to compel the grading of cream, what is meant is this,—that in those districts where there is a sufficient number of co-operative farmers, bound in a real combination, it will absolutely enable factory managers to stand on clearly defined conditions, *so that cream which was only second-class would be classed as such, and paid for as second grade.* There are portions of this State where it may be possible to do this. There are others, however, where, owing to lack of co-operative effort, there is no possibility of carrying out any such scheme.

I do not wish to discriminate, so far as my work is concerned, between the proprietary and the co-operative factory. There may be certain conditions, where a factory is endeavouring to suppress the supply of bad cream, and discontented farmers would say, "We will build a factory of our own," but in districts where they were all combined for the suppression of bad cream, that would enable the factory to insist upon supplies of good cream. Still, I think that in addition to any methods of co-operation, it will be necessary also to see that legislation is enacted which will enable managers and directors of butter factories to ensure that cream must be graded, no matter to whom it is supplied, whether proprietary or co-operative, or whether it is one of a combined number who are endeavouring to suppress bad cream supplies, or otherwise. It may be necessary in the interests of butter factories that both remedies should be used, and I think, if possible, that prior to getting the necessary legislation passed, a good deal could be done by a co-operative combination such as that which I have, to some extent, indicated, and you know how that will be likely to work in your own particular districts.

TABLE showing Percentage of Water in Butters submitted for Export from New South Wales during the Season, 1912–13.

Season.	Under 11%.				Under 12%.				Under 13%.				Under 14%.				Under 15%.				Under 16%.				Over 16%.				Samples analysed monthly and monthly average.				Total samples each month, and average.	
1912–13.	Salted.		Unsalted.		Salted.		Unsalted.		Salted.		Unsalted.		Salted.		Unsalted.		Salted.		Unsalted.		Salted.		Unsalted.		Salted.		Unsalted		Salted.		Unsalted.			
Month.	No.	Aver.	No.	Aver.	No.	Aver.	No	Aver.	No.	Aver.	No.	Aver.	No.	Aver.	No.	Aver.	No.	Aver.	No.	Aver.	No.	Aver.	No.	Aver.	No.	Aver	No.	Aver.	No.	Aver.	No.	Aver.	No.	Aver.
1912.																																		
July	..	..	..	..	.	..	..	..	.	..	..	..	..	..	..	..	..	..	5	14·79	..	..	4	15·37	..	..	..	..	..	..	9	15·05	9	15·05
August	..	..	..	..	..	..	..	..	1	12·15	..	..	..	..	..	..	..	..	1	14·15	..	..	1	15·45	..	..	..	..	1	12·15	2	14·80	3	13·91
September	3	10·58	..	..	8	11·43	..	..	19	12·53	..	..	43	13·53	5	13·59	38	14·47	20	14·56	15	15·46	8	15·44	5	16·51	6	16·28	131	13·79	39	14·88	170	14·04
October	2	10·27	..	..	8	11·56	..	..	13	12·55	1	12·90	52	13·46	33	13.64	52	14·42	116	14·50	13	15·30	58	15·40	4	17·30	10	16·50	144	13·78	218	14·70	362	14·33
November	1	10·80	..	..	4	11·57	1	11·00	12	12·70	4	12·70	59	13·45	30	13·66	51	14·41	120	14·49	20	15·30	35	15·41	9	16·54	9	16·48	156	14·05	199	14·57	355	14·34
December	..	..	..	..	12	11·61	..	..	9	12·36	2	12·27	40	13·50	19	13·61	24	14·51	40	14·47	19	15·30	23	15·39	3	16·85	5	16·81	107	13·86	89	14·60	196	14·20
1913.																																		
January	3	10·95	..	..	1	11·15	1	11·90	14	12·57	..	..	42	13·56	17	13·54	55	14·37	66	14·48	21	15·40	34	15·30	14	17·23	10	17·55	150	14·29	128	14·79	278	14·52
February	1	10·90	..	..	9	11·47	..	..	11	12·46	2	12·35	28	13·49	8	13·68	35	14·40	41	14·39	11	15·41	12	15·28	12	17·50	2	16·62	107	14·13	65	14·47	172	14·26
March	..	..	..	..	..	..	..	..	1	12·20	..	..	9	13·67	6	13·63	25	14·52	20	14·55	7	15·51	19	15·43	8	16·40	11	16·81	50	14·76	56	15·19	106	14·99
April	..	..	..	..	..	..	..	..	4	12·26	..	..	13	13·67	2	13·50	14	14·52	7	14·52	3	15·23	6	15·46	1	19·90	..	..	35	14·16	15	14·72	50	14·33
May	1	10·45	..	..	2	11·57	..	..	13	12·67	1	12·60	47	13·46	15	13·62	24	14·41	36	14·41	5	15·37	17	15·42	3	17·23	4	16·20	95	13·72	73	14·56	168	14·08
June	..	..	..	..	1	11·90	..	..	2	12·25	..	..	3	13·73	4	13·67	1	14·55	9	14·46	2	15·17	7	15·46	..	..	..	..	9	13·61	20	14·65	29	14·33
Total	11	...	..	..	45	..	2	..	99	..	10	..	336	..	139	..	319	..	481	..	116	..	224	..	59	..	57	..	985	14 01	913	14·69	1898	14·34

A Silage Distributor.

J. W. HADFIELD, Instructor in Agriculture, Hawkesbury Agricultural College.

A PATENT silage distributor, manufactured by Messrs. W. W. Bateman & Co., of Boonville, Indiana, has lately been in use at the College, and we have found it an efficient labour-saving device.

Everyone who has filled a tub or pit knows the amount of labour involved in forking and trampling the chaffed material to get it even and compact. The device, of which there are two illustrations, does good work in this respect when used in conjunction with a "blower" elevator. The distributor itself consists of a flexible pipe leading down inside the silo, and is attached to the elevator by means of an elbow. A man inside the silo can move it about at will, or direct the stream of chaff in any desired direction, while the air coming down the pipe blows the material out with considerable force, sufficient in most cases to do away with the necessity for any further packing.

The pipe is made in short lengths, and as the silage rises in the tub, the sections are removed one by one.

The elbow, which should be firmly fixed to the top of the silo, is attached to the elevator on the outside, and to the distributor on the inside.

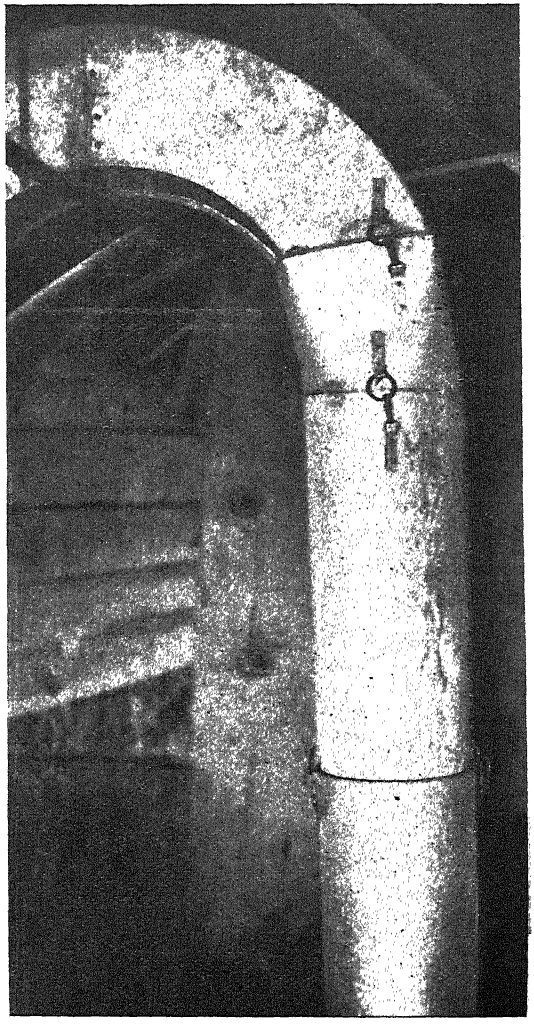


Fig. 1.—The elbow of the distributor.

The elbow sold with the distributor is square in order to reduce friction, and is equipped on the underneath or concave side with a sliding door, which allows the force of the air to be regulated to meet requirements in properly packing and distributing the feed.

Both the piping and elbows are made in several sizes to fit different sized elevators, and the height of the silo or depth of the pit will decide the length of distributor required.

The price of a 10-inch distributor, suitable for a silo 24 feet high, is about £3 3s., and an elbow of the same size would cost about 30s.

Illustrations:—

Fig. 1. The elbow of the distributor.

Fig. 2 shows the distributor being used in a pit that is almost full. A photo. in the silo was impossible owing to the difficulty of getting sufficient light.

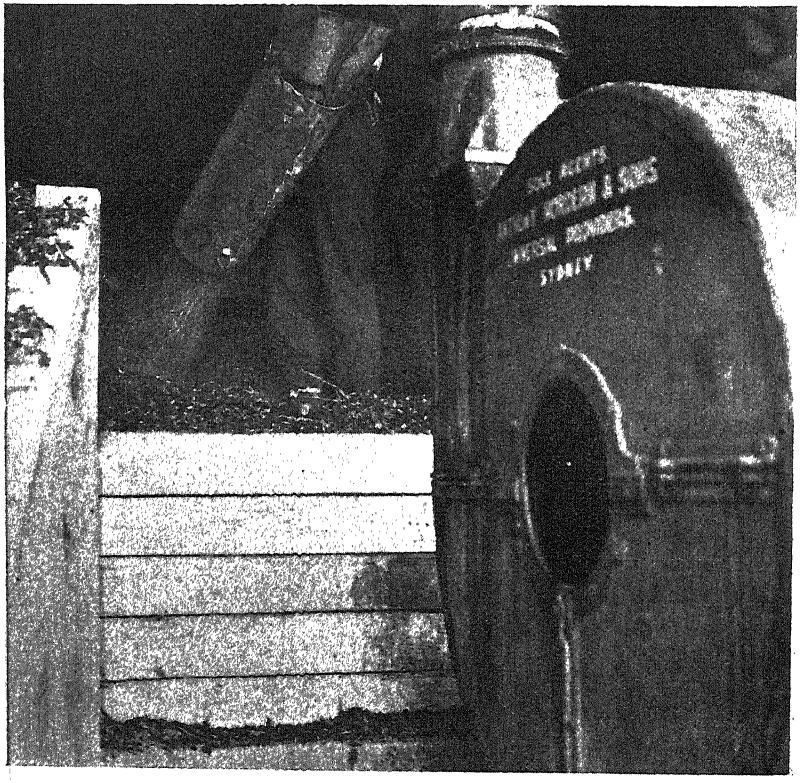


Fig. 2.—The distributor in use in a pit that is almost full.

Potato Growing in New England.

A. H. E. McDONALD, Manager, Coonamble Experiment Farm.

ALONG the New England Tableland there is in the aggregate a considerable area of land suitable for the growth of potatoes. Extensive areas of uniformly good land do not occur frequently, but right from Uralla to Tenterfield many small areas of varying size are found which make the total acreage very considerable. The most important centres are Black Mountain, Guyra, and Glen Innes. Red Range, near the latter town, has the pick of the land on the Northern Tableland. So far it has only been the richer areas which have been worked. Farmers have naturally selected the rich friable red loams. Some of the poorer grey loam has been cropped, but not to any great extent. A great proportion of this grey soil, however, when well drained, could, by the use of fertilisers, be made to produce good yields.

Around Armidale and Glen Innes there is a considerable area of rich black soil which produces large yields of potatoes when carefully worked, but the difficulty of digging the potatoes makes this land somewhat unpopular.

There is room for great expansion in the potato-growing industry. By the use of fertilisers larger areas can be brought under crop, and the adoption of up-to-date farming methods and the use of labour-saving implements would result in larger yields and greater profits. For potatoes the climate is almost ideal. Hot days rarely occur, and the nights are invariably delightfully cool. Unseasonable frosts may occur occasionally, and sometimes the rainfall may not be quite sufficient, but the latter difficulty can almost invariably be overcome by proper methods of fallowing.

As a rule the farming practice is far from perfect. Much has been heard of dry farming, and it is generally presumed that it is something invented for the benefit of farmers in the dry districts. The adoption of the same system in New England would mean an enormous increase in the yield. Fallowing is required to conserve moisture for the crop. The importance of this is almost altogether overlooked. A few of the more progressive growers realise the value of fallowing in providing moisture for the crop, but the system is not widely practised.

The necessity of working the land to conserve moisture and to keep down weeds whilst the crop is growing is appreciated by nearly every potato-farmer, and on the whole crops are fairly well looked after whilst they are growing. What is urgently needed is greater attention to the preparation of the land before the crop is planted. In such a cool climate it is not difficult to hold moisture, on account of the low evaporation. Earlier

ploughing is required, and systematic working of the fallow. In short, thorough fallowing should be practised invariably for the potato crops. Cultivators of the spring-tooth type for shallow surface working of the land should be largely used. It is impossible to overrate the benefit of such preparation. The subsoil is stored with moisture which promotes good sprouting of the seed and ensures a regular growth through even very dry spells.

Further, it renders active the agencies which increase the fertility of the soil.

The soil is sweetened, and the insoluble material is rendered available for plant use, and the soil is thus brought into better condition to support plant life.

Fertilisers are used only to a very limited extent, and yet the yield can be very largely increased by their use, especially when the soil is prepared to receive them by a system of fallowing. Fertilisers may fail to benefit the crop when the land has been roughly prepared and a dry season has ensued, but there is not the slightest doubt of their value to the good farmer. The yield may be increased by from 50 to 100 per cent. The profit accruing through the application of a few hundred pounds of fertiliser to a valuable crop, such as potatoes, is very evident. No farmer can afford when dealing with a crop such as potatoes, which costs so much for seed alone, to attempt to save a few shillings on manure.

Another matter which requires more attention is the selection of the seed. The present method leads to rapid deterioration. The practice is to save the small sound tubers. A small proportion of the seed picked up may, and indeed will produce strong, vigorous plants, but much of it gives only poor degenerated plants. Plants which have reverted or run out produce a large number of small tubers. These when planted produce the same class of plant. Such a plant may carry twenty such tubers. A good plant may carry half a dozen large table potatoes and only one or two small ones, which are suitable for seed. These small potatoes reproduce their kind faithfully, but it does not require much perception to see that when small potatoes are picked up indiscriminately for seed that very soon a great proportion of the seed will consist of run-out potatoes. Some expert growers follow the practice of going through their growing crops and pulling out any degenerated plants they detect. By this means they are able to eliminate the run-out plants to some extent, and a fairly vigorous strain is maintained. Mr. W. Moore, of Guyra, practises this method. He says, "It is only latterly that I have done this, and I ought to have been doing it all my life." Short of sowing especially selected plants in areas for seed purposes, this is about the best method that can be followed.

It is with only some varieties, and then only by expert growers, that this system can be practised, as it is often very difficult to detect degenerated plants.

A New Sun-dial.

W. E. COOKE, M.A., F.R.A.S., Government Astronomer.

WHY should not country dwellers be provided with correct time as well as those who live in the city?

Hardly a day passes without the sun being visible some time or other, and whenever the sun is visible standard time can be accurately read by means of this new dial, without any bothersome corrections, such as were necessary in the older and better known forms. Doubtless many have been prevented from utilising the sun as a time-keeper because the old sun-dial had three drawbacks:—

1. It was necessary to compute and draw a different dial for every different latitude.
2. The edge of the shadow was fuzzy and the actual reading difficult.
3. After the reading had been obtained it never gave the standard time, but had to be corrected for equation of time and longitude.

These troubles are now completely eliminated. In the new form the dial is quite easy to graduate, and is the same for all latitudes, the corrections are automatically applied, and the time can be read off with considerable accuracy. Moreover, the whole thing can be made by the veriest bush carpenter, and guaranteed to give the standard time of the State with an error never exceeding two minutes. Think what that means in the country!

A general view of the whole instrument is given in the stereoscopic half-tone, which almost speaks for itself. The dial itself may be made of wood, sheet-iron, or anything handy, provided it is fairly flat and stiff, but the best material is slate or marble. Its lower edge points due east and west, and it is set on the post at an angle, as shown. The exact method of mounting will be given later.

The portion on top of the dial is movable and is attached to the dial by a stout pin passing through the centre upon which it revolves. It is generally kept inside when not in use, and the details of its construction are shown in the accompanying sketch.

The Dial.

The following instructions refer specially to a dial 20 inches in diameter, as this is a convenient size. Obtain a flat surface 2 feet square and see that it has at least one edge (AB) fairly straight. Determine the approximate centre O and through it draw a straight line, CD, at right angles to AB. Describe a circle of 10 inches radius of which CD is a diameter. Divide the circumference of the circle into twenty-four equal parts as follows:— With compasses set as for drawing the circle put one point at C and sweep

round, striking the circumference at EF. Then similarly with one point at D strike GH. The circle is now divided into six equal portions, but it will be just as well to step them off and make them as exact as possible. Each of these must be bisected and the halves again bisected, and thus we have the circle divided into twenty-four equal parts, each corresponding to one hour. Short radial lines should be cut at these points, projecting half an inch beyond the circle. They can now be figured, C being 6 a.m., E 10 a.m., G 2 p.m., and D 6 p.m.; and the dial is complete.

The Top (Movable) Part.

This may be made of any kind of wood. Half-inch pine answers admirably and is cheap and easy to work. The base (see plan), *a, b, e, f, d, c,* is cut from a 12-inch board (any other size will do) and is 10¾ inches long (*i.e.*, from *ac* to *ef*). The angles are cut off so as to leave *ab, cd,* and *ef* each 3 inches, and then *ef* is rounded into a slight curve, so as to permit the pointer arm to swing round the centre O. All the other pieces, viz., *abhg, cdjì, ac, bd,* and *oèf* are 3 inches wide. The shorter upright *abhg* is 8 inches high and the taller one 12. The stereograph shows how they are put together far better than any description. The under side of *bd* is cut away in the middle as shown by the dotted lines on the plan, so as to allow free play to the arm *oef*. The date scale must be cut out of the paper and pasted on the base, as shown in the plan. The only precautions necessary are that the end must be 8½ inches from the centre *o*, and the centre line must point straight at *o*.

The Pointer Arm *oef*.

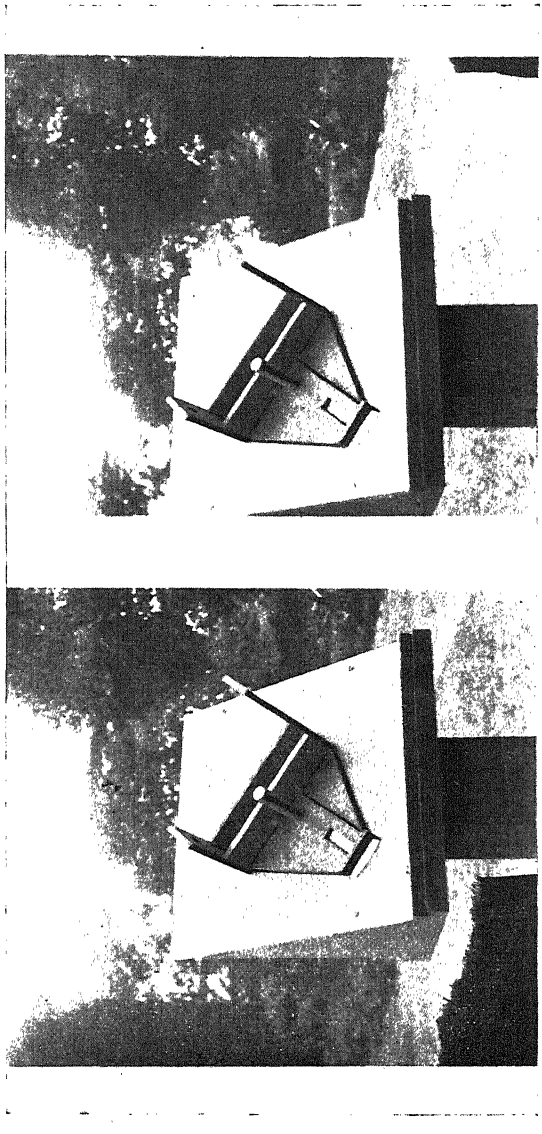
This rests or moves on the surface of the base, rotating on the centre pin *o*. Its dimensions are 10 in. x 3 in. x ½ in., the end *ef* being 9¼ inches from the centre *o*. A round hole, 1 inch in diameter, is cut at *k*, about 3 inches from *o*; and a rectangular opening, 3 in. x 1 in., cut in the lower portion to allow the date scale to show. A piece of tin is cut and bent and attached to the arm, as shown at *ef*, and a black thread is stretched longitudinally across the opening, on the lower surface, so as to come into contact with the date scale. This thread must point straight to the centre *o*. The curved edge of the tin must be exactly 10 inches from *o*.

The Clamp *k*.

This is made of a wood-screw passed upwards through the base, where it is countersunk and made tight by hammering a small length of wire into the cut of the screw-head and the adjoining wood. The end of a broomstick or any little piece of rather hard wood will do for the top part of the clamp. Put a large iron washer (1½ inches) between this and the top of the pointer arm.

The Formation of the Sun's Image.

On the bottom of the base draw a straight line, *mon*, accurately through the centre. Stand the instrument with its base on a flat surface, such as a



A Stereoscopic view of the Sun-dial.

pane of window-glass, or the slate dial, if slate is used. Through the points *m, n,* straight lines must be drawn vertically on the faces of the uprights, as shown at *m, l,* on the front elevation. It is important to have these lines perfectly square with the base. An ordinary carpenter's square is generally sufficiently correct, but it ought to be checked by reversing right and left. If there is a discrepancy between the lines obtained in the two different positions of the square, take the mean of the two.

On the smaller of the uprights, at the point *l*, 6¼ inches above the bottom of the base, bore a 1-inch hole with a centre bit. Then take a flat piece of tin (from a kerosene tin, for instance), about 2 inches square, and drill a small round hole (about ⅛ inch diameter) in the centre of it. Attach this on the outside of the upright so that the little hole is situated exactly on the line *ml,* and about the centre of the 1-inch hole. Cover the inside surface of the larger upright with white paper and draw a vertical line exactly corresponding to the one already drawn on the outside.

Fixing the Time Scale *ef*

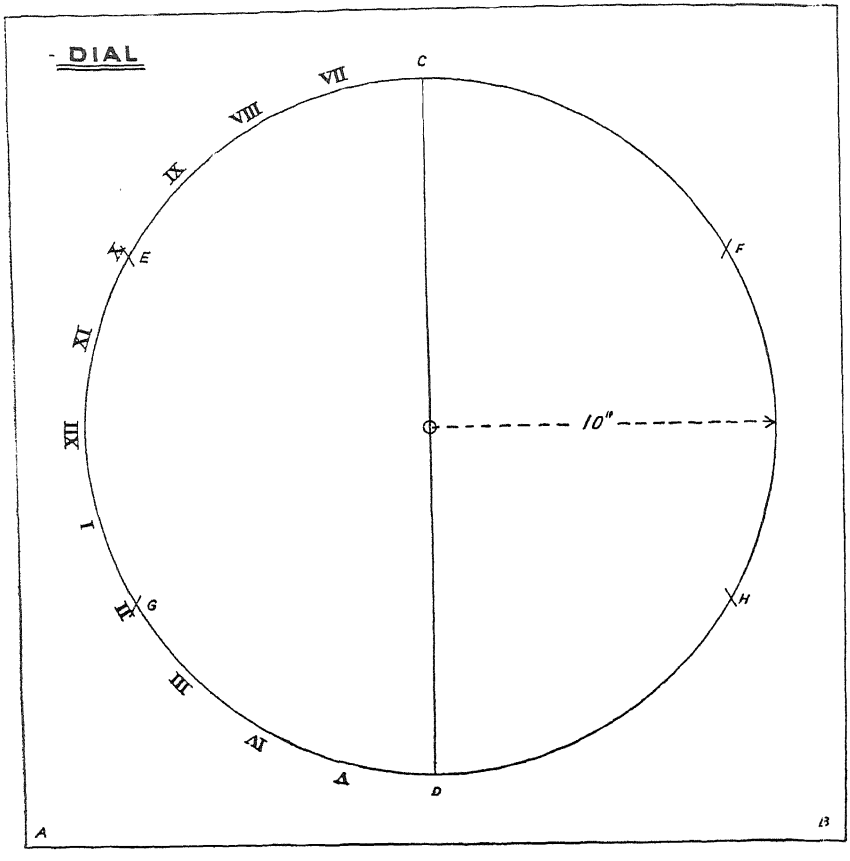
Place the whole movable top in position on the dial, which may be flat on a table for this purpose. The centre pin must pass through the pointer arm and base into the centre hole of the dial. Unclamp *k* and set the pointer arm so that the thread coincides with the centre line of the date scale. Then clamp. Next rotate the whole top until the line *mn* coincides with the centre line COD of the dial. Keep it in this position whilst you fix the time scale as follows: Cut it cleanly from the paper and run a little seccotine or similar adhesive on the back. Then place it so that the curved edge fits along the end of the tin at *ef,* and the XII line on the dial comes opposite the correct spot on the scale. This spot depends on your longitude, which you must first subtract from 150 degrees or *vice versa,* and then convert the remainder into minutes of time by reckoning 4 minutes to the degree, or 1 minute of time to every 15 seconds (″), or 4 seconds to every 1′. If your longitude is greater than 150 degrees, the XII line must come to the right of *o* (*i.e.*, "minutes to"). If it is less than 150 degrees, the XII line must come to the left of *o* (*i.e.*, "minutes past").

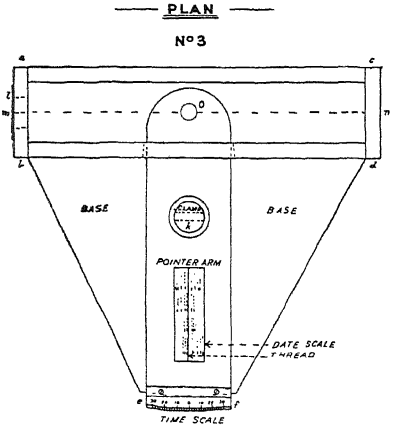
Examples:—

Longitude ...	...	151 degrees 12 minutes (Sydney).
Subtract	...	150 ,, 0 ,,
		1 ,, 12 ,,
	then	1 degree = 4 minutes (of time)
		12 minutes (of long.) = 48 seconds (of time)

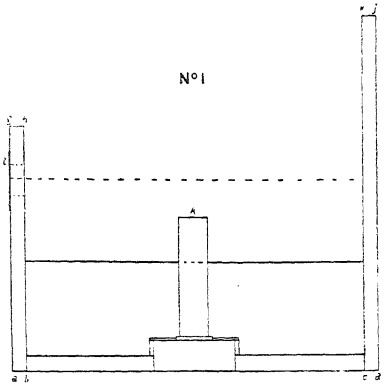
that is, 1 degree 12 minutes (of long.) = 4 minutes 48 seconds (of time).

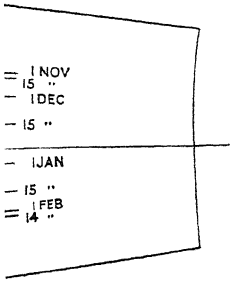
Since the longitude of Sydney is *greater* than 150 degrees, we must attach the paper, so that the XII line comes opposite 4 minutes 48 seconds to the right of 0, or nearly two and a half divisions on the "minutes to" side.


DIAL
C
VII
VIII
IX
X
XI
XII
I
II
III
IV
V
VI
E
F
G
H
10"
A
D
A
B


PLAN
No 3
BASE
BASE
POINTER ARM
DATE SCALE
THREAD
TIME SCALE

, *November* 3, 1913.





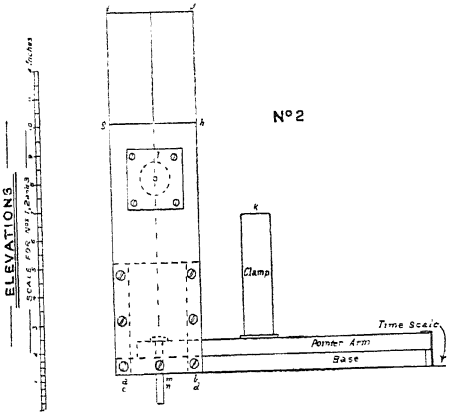
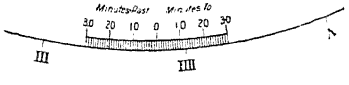


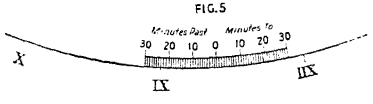


FIG. 4



ll who are desirous of
t to avoid mutilating

FIG. 5



Again longitude ... ... 148 degrees 5 minutes (Forbes).
Subtract from ... 150 ,, 0 ,,

1 ,, 55 ,,
1 degree = 4 minutes
55 minutes = 3 minutes 40 seconds.

1 degree 55 minutes = 7 minutes 40 seconds.

Since the longitude of Forbes is less than 150 degrees, we must attach the paper so that the XII line comes opposite 7 minutes 40 seconds to the left of 0, or nearly four divisions on the "minutes past" side.

Mounting the Dial.

Referring to the photograph, it will be seen that a flat piece of wood is placed on top of a stout post, and made as level as possible. Upon this are two triangular chocks which hold the dial at an altitude equal to the co-latitude (*i.e.*, 90 degrees minus latitude) of the place. It is sufficiently accurate to scale both latitude and longitude from a map. The only thing now left to do is to set the front edge of the dial AB due east and west. Before doing this accurately it will be advisable to make a rough guess at it first, and learn how to read the time. The final adjustments can then be made afterwards.

To read the Time.

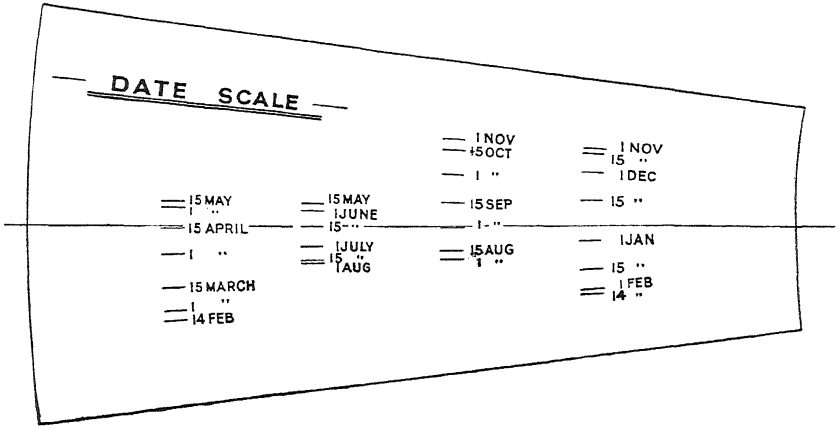
Unclamp *k* and move the pointer arm so that the thread cuts the proper date line; then clamp. The little marks are only drawn for every tenth day, so you must estimate for between-dates. Turn the whole wooden top till the shadow of the smaller upright falls on the taller upright, and you will notice in this shadow a bright round dot (image of the sun formed by the rays passing through *l*. Turn so that this dot is bisected by the vertical line on the taller upright. Then read the time by means of the time scale. There will as a rule be one, and only one, of the hour marks (on the dial) intercepted by the pointer, and the spot where this cuts the scale will give the minutes past or to the hour.

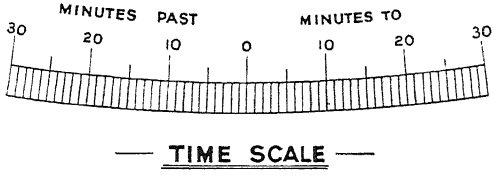
Examples:—Figure 4 shows 12 minutes to 4 p.m. Figure 5 shows 23 minutes past 11 a.m.

Final Adjustment.

It is most important to have the edge of the dial AB exactly east and west, and you are now in a position to make this final adjustment. There are two cases to be considered. Either you can independently obtain the correct time for once (say from a neighbouring post-office, &c.), or you cannot. The former is the case to be preferred, and you can make the final adjustment with considerable ease and accuracy.

1. Set your pointer arm correctly to your date scale and clamp. Then rotate your wooden top so that the time shown by the time scale is approximately correct, and of course the sun's image will be somewhere near the centre line of the upright. Now rotate the top so that the time indicated is at some whole minute a little ahead of the true time. You must leave the





As these two scales are required for the Sun Dial all who are desirous of constructing one can obtain an extra copy of this sheet to avoid mutilating the *Gazette*.

wooden top alone now, and catch hold of the dial itself, which we suppose to have been screwed or nailed on the triangular chocks; but these are free to move on the flat top of the post. Move the whole thing together round on the post until the sun's image corresponds with the centre line at the exact time for which the time scale has been set. This is the true position, and everything, up to the dial, may be made tight.

2. If you are so situated that you cannot, for once even, make sure of the correct time independently, you must proceed as follows:—

Set everything up as accurately as you can guess. About midday, point at the sun, and note where the little bright spot crosses the line on the taller upright. Make a mark with a lead-pencil. Then late in the afternoon, say an hour before sunset, point the top again at the sun, and notice where the spot comes. If it remains on the mark already made, the adjustment is correct; but if not, you must move the whole thing, dial and all, round on the top of the post until the spot coincides with the mark.

In Conclusion.

If you are thinking of constructing one of these sun dials, try to pay a visit to the Observatory, and see the one there. It will perhaps be just as well, if convenient, to ring up (Central 555) first, but you will always be welcomed and any information placed at your disposal during the regular office hours. If you are not able to pay a personal visit, the Government Astronomer will be pleased to reply to any queries, if you find yourself in difficulty.

Sickness among Chickens.

A correspondent asks the cause of the mortality amongst a batch of chickens, which, when about eight days old, began to droop their wings and mope about. Two died, but others were very sick and as light as a feather. They were incubated, and the batch was fairly successful, the percentage being 75.

In reply, Mr. J. Hadlington, Poultry Expert, stated that it is not mentioned how these chickens were brooded, and this information would be necessary before the trouble could be diagnosed. From the percentage quoted, the hatch was apparently a strong one, and no trouble should have been experienced when the chickens were eight days old. It would, therefore, appear that there was something wrong with the brooding arrangement, in regard to which the principal matters for attention are correct temperature and ample ventilation. For the first week or so the brooder should be kept at 90 or 92 degrees Fah., and this should be reduced gradually until, in about three or four weeks' time, it is lowered to 84 degrees.

Overcrowding the chickens in a small brooder, or insufficient warmth, would produce the effect referred to. Adequate warmth is the very life of the chickens for the first week or two.

It should also be stated that it is necessary to feed the chickens about every two hours for the first week or two, unless, of course, the hopper system is being used, in which case the food is always before the birds.

Herd-testing Associations.

THE following are the regulations governing the payment of subsidy to Herd-testing Associations, and are published for the information of those desirous of forming such associations.

1. Associations, to qualify for the subsidy, must first make application to the Under Secretary, Department of Agriculture, Sydney, to be registered, and subsidy will not be paid to any unregistered association. Butter factories will be eligible for registration as associations under these regulations, in which cases the management will be under the control of the Directors of such factories.

2. Subsidy shall be paid for two years only. For the first year it will be paid at the rate of 10s. for every pound subscribed by members, and expended by an Association in accordance with these regulations. For the second year the rate shall be 5s. in the £. The maximum subsidy paid to any one Association shall not exceed £200 in any year.

3. In applying for registration, information must be given as to the rate of subscription or testing fee to be charged to the members; the number of members who have joined; the number of cows to be tested; and the method of testing to be adopted.

4 To qualify for subsidy the Association must have at least twelve members, and be testing at least 1,000 cows.

5. The method of testing shall be either the Babcock or Gerber, and the records shall be kept on a system approved by the Department.

6. At the end of the first six months of actual operations, subsidy for that period will be paid on the secretary of the Association furnishing the Department with the following documents:—

(*a*) An alphabetical list of members, showing the amount of subscription paid by each as member, or amount paid for testing, the date on which subscription or testing fee was paid, and the number of cows owned by each member which have been tested. Full particulars must be given to show how the total paid by each member is arrived at.

(*b*) The record books showing the herds tested during the period for which the claim is made.

(*c*) A voucher on the Departmental form, filled up for the full amount of the claim.

(*d*) A joint statutory declaration from the President and the Secretary of the Association as to the correctness of the claim.

(*e*) A statement of receipts and expenditure for the six months in question, certified as correct by the President and the Secretary of the Association.

7. The balance of the subsidy will be paid at the end of a year's operations, and must be accompanied by similar documents to those required under Regulation 6, but relating to the period for which the subsidy is claimed.

8. The books and accounts of a subsidised Association must at all times be available for inspection by officers of the Department of Agriculture and of the Auditor-General.

9. Associations must keep their accounts in an intelligible form in cash book and ledger.

10. At the end of each Association's year, the following information must be furnished to the Department:—

..... HERD-TESTING ASSOCIATION.

ANNUAL STATISTICS.

Number of members at end of year ...	Yield of milk of 100 best cows for year ...
Number of cows tested during year ...	,, ,, of 100 worst ,, ,, ...
Amount of fee paid per cow	,, butter of best cow for year ...
Greatest number of cows tested by any one member	,, ,, worst ,, ,, ...
Least ,, ,, ,, ,,	Breed of best butter cow ... ...
How often is testing done?	,, cow giving greatest quantity of milk... ... ...
Yield of milk by best cow for the year ...	What sort of year has it been for production in the district? ... ...
,, ,, worst ,, ,, ...	

Year ended.....

NOTE.—Proper record books may be obtained from Messrs. Angus and Robertson, Castlereagh-street, Sydney. The record books will be returned to the Association after due examination.

Destroying Stumps with Acids.

H. C. COGGINS, Assistant Inspector.

[In November last the Matcham Progress Association, of Matcham, *viâ* Gosford, suggested that the Department should carry out a series of experiments in the use of acids for rotting out stumps, as a good deal of interest was being aroused on the subject, and various landholders were trying the process with not very satisfactory results. In consequence of this Mr. F. B. Guthrie, at the request of the Experiments Supervision Committee, designed the following series of experiments.—ED.]

THERE seems to have been some diversity of opinion as to whether dry and green stumps could be destroyed with acids, and with a view to determining the efficacy of this treatment, the Department decided to experiment in this direction.

These experiments were carried out according to the following design, and included both dry and green stumps:—

1. Dry—1 pint sulphuric acid.
2. Dry—1 pint nitric acid.
3. Green—½ pint nitric acid, ½ pint sulphuric acid.
4. Dry—¼ pint nitric acid, ¾ pint sulphuric acid.
5. Green—¾ pint nitric acid, ¼ pint sulphuric acid.
6. Dry—¼ pint sulphuric acid, ¼ pint nitric acid.
7. Dry—1 pint nitric acid, 1 pint sulphuric acid.

The stumps treated were of the spotted gum, box, and ironbark variety, and were from 18 inches to 2 feet 6 inches in diameter.

Holes were bored with a 2-inch auger in the stumps about 18 inches from the earth-line at an angle of 45 degrees to a depth of 18 inches. Each stump was then dosed according to the design; the holes were then immediately plugged with green plugs.

Periodical notes were taken as to the action of the acids, and as six months have now elapsed, a sufficient time has been given to prove the experiment a success or otherwise.

It must be understood that the whole of these stumps were perfectly sound and solid, also that two out of the three varieties, viz., box and ironbark, are extremely hard wood, and if the acid would eat through these stumps then the majority of other timbers would be easy victims.

The final examination showed that, in the case of the dry stumps, in every instance the action of the acids had no appreciable effect, and beyond a very slight crumbling of the wood—in extent about 1 inch—in the immediate vicinity of the hole no other effect was noticeable.

As regards the green stumps, in both instances the effect seemed to be slightly better, the wood in the immediate vicinity of the holes had rotted to a depth of about 2½ inches, but beyond that sound wood was found; in addition both stumps had thrown out vigorous suckers.

The above result clearly proves that sound stumps cannot be destroyed with either sulphuric or nitric acid or both, and these two acids are of the strongest known.

The experiment has an additional value, inasmuch as it has provided the actual cost per stump as against other methods.

The average cost per stump worked out at 1s. 9d., which includes cost of acids and labour paid at the rate of 7s. per day; and it is an open question whether men could be found to work with two such dangerous acids at that figure.

In the event of the success of the acids, the great drawback to clearing land by this method would be the vast amount of valuable time wasted in waiting for the stumps to rot away, irrespective of the danger of handling the acids, and when time is taken into consideration—and in every instance time is money—cheaper and quicker methods may be adopted.

Mr. C. W. Brown (Jilliby), in the *Gosford Times,* recounts his experience in connection with the use of sulphuric and nitric acids for destroying stumps:—

I thought I would have a try myself, as I have some heart-breaking stumps here, and as I take out everything in front of me, regardless of size, I thought that the acids would prove a great labour saver. Having purchased 4 gallons of sulphuric and nitric acids (2 gallons each), I started operations on a green grey-gum stump 4 feet high, and diameter 4 feet 6 inches. In that stump I bored three holes with a 2-inch auger, going the full depth of the auger, and in those holes I poured equal quantities of the acids, then plugged up with a green spotted gum plug, having previously put same in paraffin, which I had melted, and then also poured some of the paraffin over the plug to make certain that it was air-tight. I next tried a dead blackbutt stump, 10 feet high and 4 feet 9 inches across it on the top, the giant at the butt being 24 feet 2 inches. I bored four holes with the 2-inch auger, going its full depth, and repeated the same process as I did with the grey-gum stump. After waiting patiently for six weeks, I knocked out the plugs and refilled up again both stumps. From the time of refilling to the present day is five and a half weeks, or in all eleven and a half weeks, using in all 2¾ gallons of acids on the two stumps, and the only difference in them is what I pulled out with the auger. Having given the acids a first-class trial, I have to turn round again and use what I have been using for the last five and a half years, gelignite, and it will be a hard job to find its superior.

I find throughout the State that farmers in several districts have started clearing by this method, and in every instance it has been discarded in favour of more reliable and quicker methods.

Tank-sinking.

CHARLES J. WOOLLETT, Stock Inspector, Cobar.*

OWING to closer settlement and new owners of properties coming to the district, a vigorous policy of improvement has been going on for some time in the way of tank-sinking for the conservation of water.

Travelling about as the writer has to do in the course of his duties, he has had many opportunities of seeing the work in progress, and by careful observation has noticed the great disparity between the methods of different men in doing the work. Some of the contractors do very well, whilst others admit, when working under similar conditions, that perhaps they have just cleared expenses. Employees when working together in the same tank show marked differences in the ease with which they do their work. The horses or bullocks are worked by some men in such a way that they hold their condition, work without much apparent effort, and at the end of the day show little evidence of fatigue; whereas others "knock themselves up," as well as their charges, and do not get through as much work. Apparently an important adjustment of tackling has been, in the writer's opinion, responsible for the greater ease with which some men work than others.

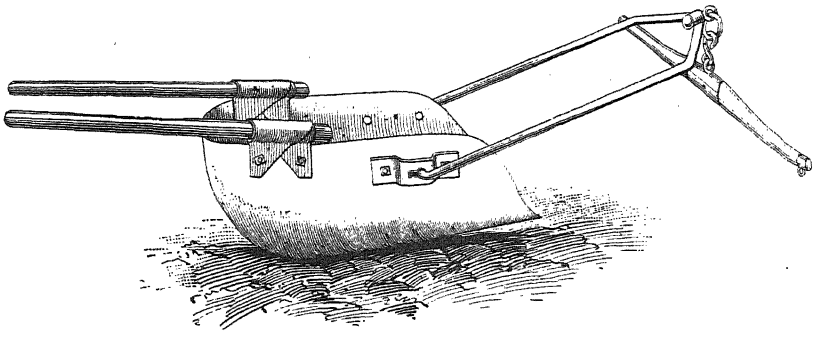


Fig. 1.—Type of small scoop generally used.

Adjustment of Scoop.

The reader will observe that at the bottom of the scoop are two rods of iron. These are termed the cradles. After being used for some time, they wear very thin. At this time they should be removed, and fresh cradles riveted on. Very frequently the writer has observed the cradles missing

* The writer is indebted to Mr. T. M. Cummins, District Works Officer, Dubbo, for much of the information contained in the above article, obtained, as it was, by watching his work.

altogether. With a moment's reflection it must be admitted that this is unwise. Where the scoop is drawn with the whole of the bottom in contact with the ground, the friction is very much greater than when gliding along on the rockers or cradles. The energy lost during the day through the extra load on the draught animals would have to be replaced in the form of feed if the animals are to hold their condition.

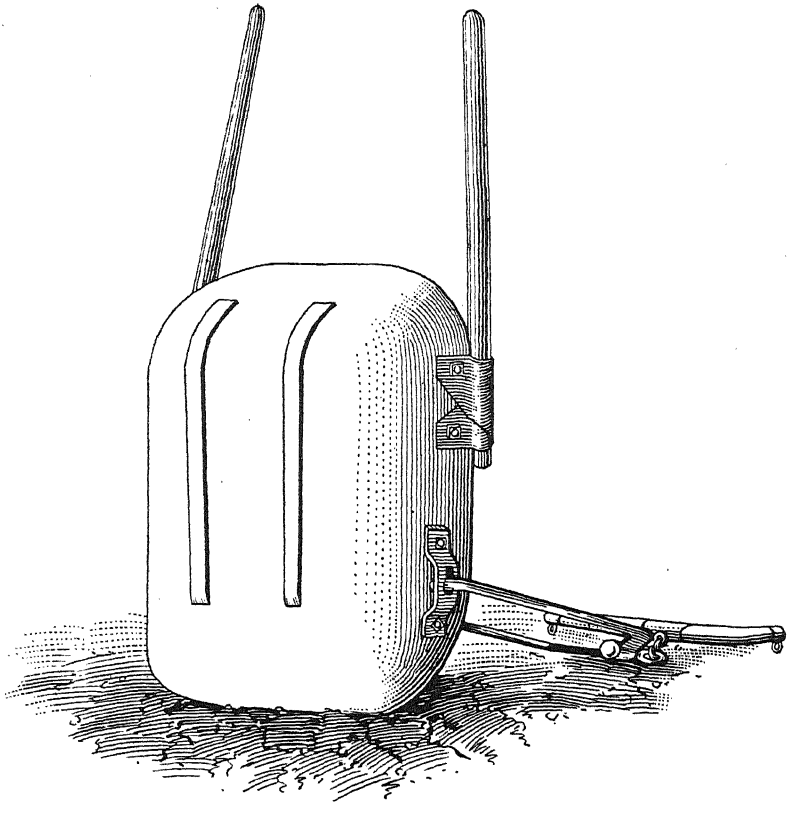


Fig. 2.—Back showing cradles.

In the photograph the handle of the scoop is as usual straight. On one occasion a man, using a quarter-yard scoop, who worked leisurely and yet removed more earth than his mate who bustled, was asked how he did it. The handle of his scoop was bent upwards, whilst the handle of the other scoop was straight. He argued that he did not have to bend his back so much or use so much strength when filling and turning the full scoop over as the other man. As this performance would be repeated very many times in a day, it is not hard to conceive the force of his argument. A very significant fact, too, is that he always got 10s. a week more than his mates for this particular work. It must not be understood, however, that the above is the

only recommendation about him. In short, he used his brains as well as his muscle, and thought about every step in his work. He also followed the plan as indicated in the following paragraph.

When scoops are new they are always bevelled upwards at the mouth, as in Fig 2*a*.

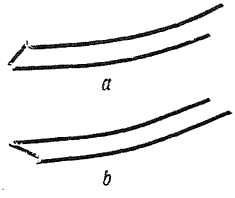


Fig. 2.

When scooping, the ground is always previously ploughed or picked, unless very soft. By having the mouth bevelled, as in Fig. 2*a*, the draught is always heavier when full than when it is as in Fig. 2*b*. In the first case it takes more power on the handle to raise the mouth of the filled scoop to the surface, and then it "bites," and has a tendency to work downwards. It requires not a little effort to keep the mouth up. When bevelled as in Fig. 2*b*, much less pressure on the handle sends it up, and then it glides over the top of the loose earth without any trouble, and the handle is not touched again until it is necessary to empty the scoop.

When used for some time, the mouth of the scoop gets very thin, and it buckles into all sorts of shapes. In such a condition unsatisfactory work is done. To prevent the buckling, a piece of ¼-inch x 5-inch steel is riveted across the mouth, and bevelled as in Fig. 2*b*.

Removing the Earth.

Care should be taken with the ploughing, as this enables the scooping to be done with facility when the ground is ploughed at a uniform depth. Then the scoop is not bobbing up and down, damaging the temper of the scooper and giving him an occasional dig in the ribs.

The earth on which the embankment is to be built should be ploughed so that the removed soil will incorporate with it. If this is not done, there is a risk that, should the water overflow the excavation, it would percolate between the hard undisturbed soil under the embankment and the soil of the bank. With this "weeping" there would be danger of a break-away in the embankment.

A frequent lack of judgment on the part of tank-sinkers is shown in the method of placing the dirt removed from the excavation to form the embankment. The first lot scooped is generally placed near the margin of the excavation, and so long as this continues the horses or bullocks have to climb over the formed bank, and drag the filled scoop over it too, and is emptied at the back. It must be very obvious that, considering the workmen and the strength of the animals, the operations should be reversed. The first earth removed should be placed farthest back and the embankment built from behind.

To increase the storage capacity of the tank the embankment should be built well forward.

Drains.

Wide, shallow drains are much to be preferred to narrow, deep ones. A drain 4 feet wide and 9 inches deep is much better than one 2 feet wide and 18 inches or 2 feet deep. With the wide, shallow drains the flow of water is slower, and there is very little scouring. The silt removed from the drains, of course, becomes deposited in the silt tank, and, when that becomes full, in the main tank. This is a very important matter. For the same reason, the drains should have a slight fall. Where scouring is likely to take place in drains, the following method is very successful in preventing it:—A trench about a foot wide and 18 inches deep, and extending a couple of feet each side of the drain, is dug across it. This is filled with stones of 2 or 3 inch gauge. The efficacy of this apron is seen along the roads in this district. This apron could also be used on farm and station roads where there are washaways. The time taken in making the apron is very short as compared with that lost in travelling round deviations.

Where drains curve they should be widened; the sharper the curve the more should the width be increased. By this means there is less likelihood of the water overflowing. As a double safeguard, an embankment might be placed on the lower side.

Sometimes drains meet before reaching the tank. In addition to widening the main drain at the confluence, they should be made to meet at an acute angle, otherwise there will be considerable silting up, until ultimately the water would find its way over the bank and be lost.

Measuring Drains.

Where the total length of drains runs to several miles, it is a very tedious proceeding to measure them for contractors' payment. A chain-tape is generally used, but there is great risk of error. The following method in measuring up road-work is very simple, yet accurate, and it could be applied similarly in measuring drains, lines of fencing, etc., where it is possible to drive in a straight line:—A piece of white paper is tied round a spoke of the wheel of the buggy. The vehicle is then advanced until the wheel makes a complete revolution. A mark having been made on the ground before starting, the circumference of the wheel is easily measured. With two persons in the vehicle, the counting is easily done whilst the driver steers a straight course. The second man counts the revolutions, and when up to ten calls aloud "ten." The driver says "one." When another ten is reached, the second man calls "ten" again, and the driver says "two," and so on.

Taking an example:—Suppose the driver counts 43 and the other man has 6—therefore, there are 436 revolutions. If the wheel is 14 feet 8 inches in circumference, then the total distance would be 6,394⅔ feet, or nearly 97 chains.

The Prickly Pears of Interest to Australians.

J. H. MAIDEN, Government Botanist, and Director of the Botanic Gardens, Sydney.

No. 8.—Opuntia dejecta, Salm.-Dyck. Syn.: Nopalea dejecta, Salm.-Dyck.

FOLLOWING is a translation of the original description :—

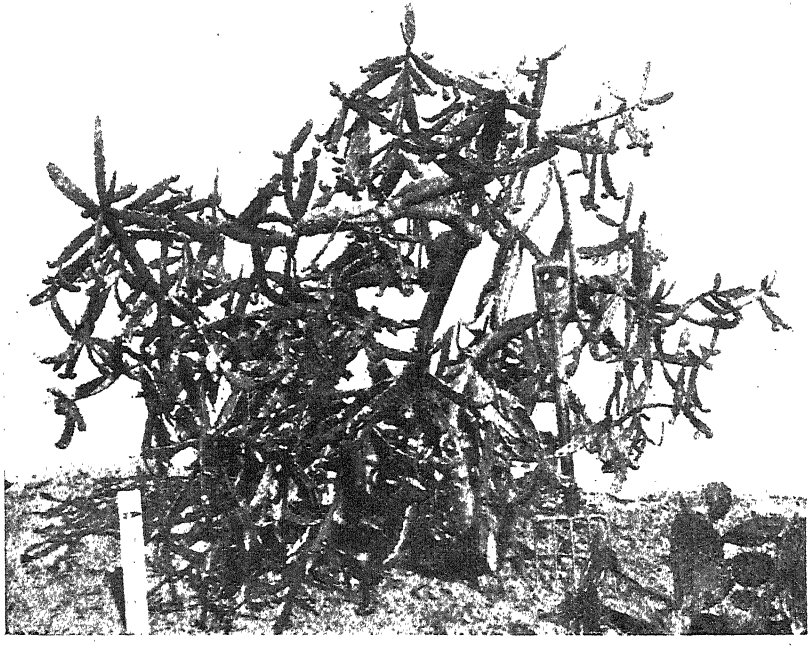
An erect species with divaricate joints very much compressed, elongated, narrow, green. Areolas far apart, scarcely tomentose, spines biform, the upper ones bristly and whitish, the lower ones 5-6 in number, the lowest one longer.

The joints 8-9 inches long and barely ½ inch broad, thin, sometimes diffuse or hanging down.

Areolas far apart, subtended by an elongated and very spreading leaflet.

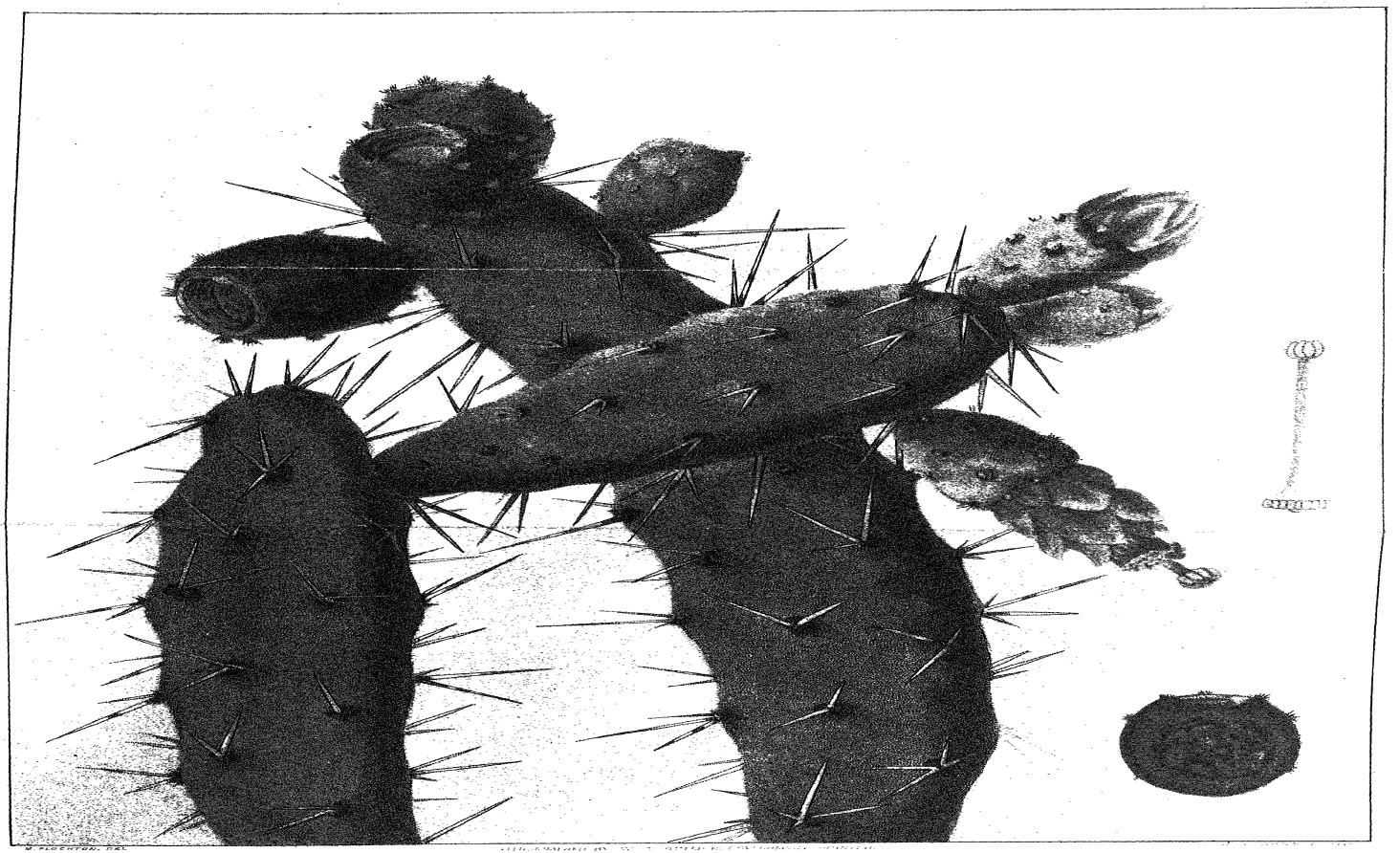
The spines stout, the lowest one longer by a thumb's breadth.

This species differs greatly from all the other species by its elongated narrow joints arranged in a peculiar way. Flowers not known. It is found in Havannah (Cuba) (*Hortus Dyckensis*, p. 361).



Opuntia (*Nopalea*) *dejecta*, growing at Botanic Gardens, Sydney.

The genus *Nopalea* differs from *Opuntia* mainly in the stamens and pistil being longer than the petals, which are connivent—that is to say, point or press together—about the pistil, when in full bloom, instead of spreading out into a bell-shaped flower like the *Opuntias*.



OPUNTIA DENTATA AIAM UPUM.

From the plate the difference in the appearance of a *Nopalea* flower is at once obvious, and, considering what a complex genus the *Opuntia* is, it would appear to be desirable to seize on a well-marked character, like the shape of the flowers, and keep *Nopalea* and *Opuntia* apart.

In No. 3 we have dealt with *Opuntia nigricans*, Haw., and it would appear that that is an intermediate form between *Opuntia* and *Nopalea*. I am quite aware that the lines of demarcation are not rigid.

Habitat.—It is a native of Cuba, off the southern United States, and is said to be common in cultivation, or escaped from cultivation, in Mexico.

In Australia it is found in the Rockhampton district, Queensland, where it is not rare. It would appear to have been in cultivation in Sydney and Melbourne for many years.

With us in Sydney it forms a tangled shrub 6 feet high, but in Queensland it attains a rather greater size, with single stems. It certainly looks a formidable plant, but it is not very aggressive at present. At the same time, I recommend that it be kept within bounds whenever seen.

It would not appear to be a very well known species, for I have received it under four *Opuntia* names, all wrong.

Pears in Cool Storage.

Late in March last, two cases of Packham's Triumph pears and one of Baron de Mello were forwarded from Bathurst Experiment Farm to Sydney and placed in the cold stores, in order to test their keeping qualities.

They were inspected by Mr. J. G. R. Bryant, Assistant Fruit Expert, on 7th June, and he reported that the fruit was in splendid condition, and appeared as fresh as if just removed from the trees. The temperature at which the room was kept was from 36 to 38 degrees Fah.

They were again inspected on 19th August, and owing to their commencing to waste, it was decided to market them. The case of Baron de Mello was absolutely useless for sale, and was classed by the agents as a very poor keeper, and in their opinion totally unfit for storage purposes.

With regard to Packham's Triumph, Messrs. J. and G. Roughly reported that they were on the whole extremely satisfactory. One case was partly ullaged when removed from cold storage. The other case was in perfect condition and of splendid quality, as evidenced by the price realised (20s.). They conclude, "We have no hesitation in stating that this variety is eminently suited for storage, an opinion strengthened by the fact that a sample kept by us was in first-class order a fortnight after removal."

Studies in Prickly Pear in the Western United States.

W. MERVYN CARNE.

[The following informative letter is from Mr. Carne, a Scientific Cadet of the Department of Agriculture, written to me on 2nd August from Tucson, Arizona. Tucson is the headquarters of the Carnegie Desert Laboratory; further, valuable researches on "Cactus" (Prickly Pear) have been conducted at the Arizona Experiment Station at Tucson, which preceded the Laboratory. "Chollas" are Prickly Pears, cylindrical in shape and full of spines.—J. H. MAIDEN, Government Botanist.]

As a result of observations made during the past few weeks, I have formed very definite opinions in regard to the spreading of cacti here and in Australia. As I do not recollect that the matter has been definitely regarded in the same light, I have consulted with such authorities as Drs. Griffiths and Wooton of the Department of Agriculture of Washington, Professors Foster and Thornber of the University of Arizona Agricultural Experiment Station, Tucson, and Dr. Shreve, of the Desert Laboratory of the Carnegie Institution, also at Tucson. These gentlemen have made the cacti a special study. They agree with me that the spreading of the cacti is in the main controlled by rainfall (or rather available moisture) and temperature. Though undoubtedly the rabbits do check the growth of seedlings, and the plants are subject to certain insects, fungi and bacteria, their effect is practically negligible. There seems no hope that the Queensland Commission will find any natural checks of such a kind that they may introduce into Australia. A sufficiency of moisture and absence from frosts are the great controlling factors in their distribution.

(*a*) Cacti have not spread rapidly in the past in the south-west portion of North America, owing to: -

1. Limitation of available moisture.
2. Minimum temperatures.
3. Grass fires.

(*b*) Cacti are spreading faster to-day in the same area, due to:—

4. Scarcity of grass fires.
5. Distribution of stock.

1. Cacti require a certain amount of moisture. Their hardiness lies in the fact that they can rapidly store available supplies, upon which they can survive prolonged droughts. Experiments at the Desert Laboratory have shown a distinct swelling of the joints almost immediately after a shower. Fugitive rootlets aid in this rapid absorption. At Tucson, with a rainfall of 11–12 inches per annum, the cacti grow very slowly, so slowly that their cultivation for stock forage is almost unjustified under desert conditions. Of course they grow rapidly under irrigation. Where the "caliche," *i.e.*, the limy hardpan, comes close to the surface, the soil does not seem to hold sufficient moisture, and cacti are not common. It would seem that a minimum of 10 inches and a sufficient depth of soil is necessary, or a higher rainfall.

2. The relation to temperature is even more distinct. At Tucumcan, New Mexico, at an elevation of 3,600 feet, with an average rainfall of 21 inches, I noted very few cacti, and those all of the prickly-pear type. They are so few and grow so slowly that in the opinion of J. E Mundell, Manager of the Experiment Station, they could not constitute a stock-feeding factor even if singed. The temperature usually drops to zero in winter and the cacti are injured. At Las Cruces, in the same State, with an elevation of 4,000 feet and a rainfall of 9 inches, the cacti are even fewer, although several specimens were noted to be fruiting freely.

Going by rail from El Paso, Texas, across New Mexico to Tucson, Arizona, as soon as the train commences to run down to the latter State, cacti appear and become rapidly more plentiful. At Tucson, elevation 2,400–2,500 feet and rainfall about 11 inches, they are common wherever the soil is fairly deep. They run from the lower mesas 2,500 feet to the upper mesas 3,000 feet, and even to the foothills up to 4,000 feet, but the great majority are between 2,400 and 3,000 feet. Tucson appears to be about the moisture and frost limit of the cacti. The foothills have a rainfall of 15–20 inches, but from time to time the temperature will drop below the safety point (about 10–12 degrees F.) so that the tendency to spread northward or on to east and west highlands is checked. Last year an exceptional frost cut many of the wild cacti at a temperature of about 5 degrees F. It was interesting to note that the pear forms resisted the frost more than the Chollas or cylindrical forms. This is in keeping with the fact that the New Mexican forms seen were all of the pear type.

The spineless Burbank cacti have been found unable to withstand the high temperatures even when watered.

3. Cacti in the past have, undoubtedly, been kept in check by grass fires.

To-day, owing to the excessive overstocking of the open range, it is very rare that any grass gets an opportunity to mature and dry off, and fires are almost unknown upon the mesas. Under the protected conditions of the Santa Rita Range reserve, about 30 miles from Tucson, considerable grass grows upon the upper mesas and foothills, and fires are a regular occurrence. These fires always leave a trail of burnt young cacti.

4. This has become such a feature that it is evident that the cacti would spread fast in the absence of fires, and that they have done so on the reserve in parts where fires have not occurred, that it has come to be recognised that to maintain the grass free from cacti regular burning over is necessary. Where the grass has been eaten out the cacti are spreading, and under the present range conditions their spread is looked upon favourably, as the cacti are considered superior to the Covillea and Acacias, which otherwise occupy the ground.

5. Stock undoubtedly spread the plants, mainly by breaking off the tops of the branches of the Chollas, and by carrying joints and fruits attached to their faces. But they damage young seedlings by tramping, and are in fact the greatest natural check outside the checks of moisture and frost.

Seeds appear to germinate freely in the case of the pears, but in the Chollas reproduction is vegetative, the fallen fruits and joints giving rise to new plants. Dr. Shreve considers the mortality of young plants to be due to washing out by torrential rains, rabbits, gophers, and other small animals, and to the tramping of cattle.

An area of 300 acres of poor lower mesas without grass has, under protection, made little increase in grass and very considerably in cacti.

Considering these points it appears clear to me that the reasons for the rapid spread of the prickly pear in Australia are to be found in an area favoured with a sufficient rainfall—nowhere less than 15 inches I believe, and probably exceeding 25 inches in places, with an absence of grass fires and a temperature not dropping below 10 degrees F. According as the protection from fire and frost increases and a water supply is assured by rainfall and depth of soil, so long will the cacti continue to spread.

It has been stated that the cacti of Mexico, Arizona, &c., rarely get an opportunity to ripen their seeds. This is entirely incorrect. I have seen any quantity of ripe fruit upon the flat segmented prickly pear forms as well as upon the cyclindrical chollas. The fruits of the former are eaten by stock, rabbits and birds, the seeds are distributed and do germinate, but for the reasons mentioned spreading has been slow. It must be understood that germination to be successful must occur under favourable conditions, that is when the ground is kept moist for some time after germination.

The giant cacti produce small seeds which rarely germinate, but this group is of no economic importance.

Whilst the pears are singed for feeding to stock, it is the fruit of the chollas that is eaten. Unless removed the fruit of these cacti remains hanging until in about three years one plant may carry over 100 lb. of fruit. As they get older the fruits do not shrivel but lose their spines and are readily eaten by stock. If they fall they grow into new plants, and it is common to find an old cholla surrounded by a ring of young plants.

The life period of chollas is about forty years, and giant cacti well over 100 years. The pear fruits ripen and fall quickly if not eaten.

Another Native Plant reported as a Nuisance.

(See this *Gazette* for October, 1913, p. 911.)

A lessee in the Inverell district recently wrote as follows to the Lands Department :—

I have enclosed you a package of a weed that has overrun my improvement lease, 727 and 728, parish of Severn. This plant grows to perfection on the land that I have ringbarked, and on the unringbarked portion it is more of a stunted nature. It is from 1 to 2 feet high, and too thick for anything else to grow, and stock will not touch it. There is no grass on the property for stock, and I will wait until there is a good rainfall to see if anything will grow before I do any further improvements. I had about 200 head of mixed cattle running there last summer, and they got very poor, and lived most of their time on the pear, of which they destroyed a lot, and without the pear they would have had to be removed sooner than they were. I have no stock there at present; they are on my settlement lease, which caused me to be overstocked. I had to remove

the first week in June, and thinking I would get feed again this spring, I am not able to remove them back to settlement lease, as there is no feed growing, only this rubbish. I am compelled to send these 200 head on agistment country. Will you please have this weed analysed? A peculiar feature of this weed is that the flower is open during the day and closes at night. The place is now a mantle of yellow flowers and looks very pretty.

I reported in the following terms :—

The weed in question is a native plant, whose botanical name is *Senecio lautus*, variety *capillifolius*.

I have never heard of a native *Senecio* (which belongs to the Daisy family) being reported as injurious to animals. An allied plant, *Senecio Jacobea*, though a weed, is eaten by sheep in England without injury, although in New Zealand it is reputed as inducing cirrhosis of the liver in stock. It is not likely that analysis will disclose the presence of any poisonous principle, and therefore I do not recommend that this expense be undertaken.

Plants like these are propagated by seeds which have a feathery-like appendage, and they can be blown over long distances. Further, each plant produces an enormous amount of seed. I know of no practical method by which plants of this character can be controlled. If there were but a few plants in a paddock, they could be hand-pulled not later than the flowering period and before they start to scatter their seed, but the circumstances are different in this case.

It is a fact that thistles and other allied plants sometimes die out from areas where they were plentiful. While this is undoubtedly a fact, the determining cause is obscure, and it may be that the necessary rain for germination does not fall in a particular area at the time the seed requires it.

In the present case, what has probably happened is this: The ordinary herbaceous vegetation (including grasses) edible by stock may be mainly composed of annuals, depending on the annual production of seeds, and consequently not able to withstand cropping by animals beyond a certain point. This point may have been exceeded in the present property.

There are certain plants, of which this one is an example, which provide themselves with a defence against herbivorous animals in the shape of bitter or acrid or other deleterious properties, or strong-smelling oils, or resinous exudations, or a covering of hairs or spines. These being not interfered with by animals, go on to the seeding stage, and take the place of the fodder plants which are either eaten out or have not been permitted to propagate their kind. The ripening of this weed seed may, of course, take place some distance away, but the presence of seedlings from this weed seed becomes obvious to a lessee when he sees them actually springing up on his property, where they have taken the place of the forage plants which have been eaten out.

From what has been said it will be observed that no remedial measure of the press-the-button order is applicable in this case.

I may add that the native plant formerly reported on, *Olearia viscidula*, also belongs to the Daisy family, and its seed also blows about and invades land. It has a resinous exudation, and has a bitterer taste than the present plant. Very few native plants have been reported as making themselves a nuisance to the grazier.—J. H. Maiden, Government Botanist.

Profitable Brood Combs.

[Continued from page 806.]

R. G. WARRY, Demonstrator in Apiculture.

Setting Sheets of Comb Foundation

A FULL sheet of comb foundation makes the brood frame ready for the bees. The sheet can be fastened to the under side of the top bar by either the wedge and groove arrangement or by the moulded comb guide and Daisy Foundation Roller; if the wedge and groove frame is used, the wedge must be jambed tightly into its slot, or the sheet of foundation may slip out of place. Sheets of comb foundation are also attached to brood or extracting frames with melted wax, applied through a specially constructed wax tube to the junction of the sheet and top bar of the frame. When following this plan, the woodwork must be quite dry and free from dust, or the wax will not adhere properly; this applies equally well to the moulded comb guide method. A good plan is to adhere to one plan for fastening foundation in all brood frames. The moulded comb guide and Daisy Foundation Roller are recommended, as it is quick, and the sheet can be firmly attached to the top bar. The wedge and groove plan is equally as quick, but it has two disadvantages. The whole of the sheet is not utilised, a small part of it being within the top bar, whilst the wax moth pest will burrow into and damage this pattern of frame far more than it will the moulded comb guide pattern. For the other ways of attaching foundation to frames, a lamp and vessel of melted wax are necessary; these will be found too slow if a frame of foundation comb should be wanted in a hurry when none chances to be on hand.

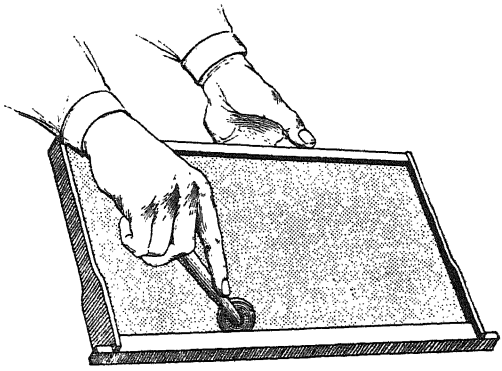


Fig. 6.—Fastening foundation to a moulded comb guide.

Before finally fastening the sheet of foundation, it must be set so that it will hang true in the frame, with a space between its three unattached edges and the sides or bottom of the frame. When placed in a strong cluster of bees, especially in warm weather, a sheet of foundation is liable to expand; if so set that, during expansion, the sheet touches any of the woodwork of the frame, it will buckle and produce an uneven comb.

In order that the wires may hold the sheet in position whilst the bees are working on it (drawing it out), and that the wires may lie as nearly as possible inside the midrib of the finished comb, they must be embedded in the wax sheet. For embedding, a board is required, small enough to fit loosely

inside the frame, and thick enough to keep the frame from touching the table when the board is laid down first with the frame round it, the frame being placed with the foundation touching the board and the wires lying on the foundation. A spur wire embedder or an Easterday embedder passed firmly over the wires whilst the frame is in this position will cause them to sink into the wax sheet and hold it in position. Comb foundation needs to be warm and pliable to get the best results; if too cold and inclined to be brittle, the wires will not enter the wax properly. They may enter and be apparently secure, but soon after the frame has been given to bees, the wires will spring away from the sheet if the latter has been used when too cold; the foundation then hangs loose, and gives an unsatisfactory comb, the bees being forced to build cells round the bare wires, which they dislike; but when the wires remain well within the sheets, they pass between the bases of the cells on either side of the comb and are no hindrance to the bees. If embedding must be done in cold weather, it is a good plan to warm a small pile of sheets in the oven, or to place them separately on a flat board in the sun; in the latter case, they warm rapidly, but they must not be allowed to soften too much.

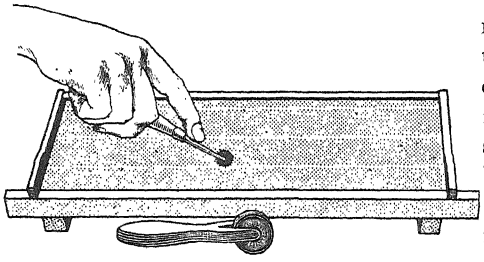


Fig. 7.—Embedding wires.

Lately, an improved form of the Easterday embedder has been put on the market; its blades are placed on a wheel instead of on a segment of a circle. The circumference of the wheel has been so determined that when it is passed across the length of a brood frame it will revolve once. One blade is broken out, leaving a space or notch on the circumference of the wheel. This notch is the starting point for embedding a wire, and is placed over the edge of the frame, allowing the first blade to come down close to the inside of the frame, and press the wire at its very beginning—a thing which is somewhat awkward to do with some of the other forms of embedder. After the wheel has crossed the frame once, the notch will fit over the end bar of the frame on the far side, the last blade coming down close to the wood.

To ensure that every frame is properly supplied with strained wires securely embedded in foundation is of the greatest importance, for much of the durability of the comb and the ease with which it can be handled depends on this work. One uneven comb in a brood nest causes others to be built out unevenly, and will be a continual source of annoyance.

Some Reasons for Using Full Sheets of Comb Foundation in Brood Frames

Among the things necessary to producing a profitable brood comb, a full sheet of comb foundation has been mentioned. When used in every brood frame, the full sheet may seem to be an extravagance. In reality it is the reverse; the full sheet of foundation is a decided means of economy to the bees.

A sheet of comb foundation is an artifical midrib, thicker than when naturally built; it gives bees the beginnings of worker cells and an extra amount of wax with which they build some part of the cell walls when drawing out the foundation. The beginning of each cell is found in the impression of its base and a very small part of its wall, made in the sheet by the foundation mill. Bees thin down the wax sheets given them and apply the wax thus obtained to the construction of the comb as they draw it out. A newly-built comb, drawn out on a full sheet of foundation made from wax mixed with lampblack, will show that a proportion of the finished comb is built of blackened wax, and if a section of this comb is examined, it will be seen that the original artificial midrib given (the sheet of foundation) has become thinner. This experiment can easily be carried out, and it will clearly demonstrate that a full sheet of foundation, properly fastened, not only determines the position and contour of the finished comb with regard to the frame, but supplies the bees with a good percentage of all the wax they require for constructing a complete comb from the frame of foundation given them.

When a swarm of bees is hived in a box with no artificial aid to comb building given it, the whole of the comb necessary to the colony must be secreted and built by the bees; this involves the consumption of a quantity of honey, as well as taking time to allow the colony to strengthen and gather stores. Nurse bees, *i.e.*, young bees, are of the greatest importance to a newly-hived swarm or to a nucleus colony building up. The quicker the opportunity given the queen to lay a large number of worker eggs, the faster the colony can improve itself; for the older bees, which have to some extent lost their power to secrete chyle food, are liberated more quickly to field work. Their places as nurse bees are filled by the first batch of young bees hatching, which are better adapted to feeding than the bulk of the bees forming the swarm.

If two swarms of equal strength are hived on the same date, one in a box with no foundation, the second in a brood chamber furnished with full sheets of comb foundation, the latter will develop and be ready to gather a surplus far before the former, one reason being that the latter can produce a large number of nurse bees before the former.

Starters.

The term starter is applied to a narrow strip of foundation attached to the underside of the top bars of brood frames. Shortly after frames were invented for bee-keepers, and before comb foundation was known, many methods were employed to induce bees to build their comb within wooden frames. Amongst the different devices used was a narrow strip of wax fastened in the same way as a starter. This was successful to some extent, but soon after foundation came into use, a strip or starter of comb foundation was substituted for the plain strip of wax with more success; evidently bees preferred the embossed wax sheet, which more nearly resembles comb, to the plain strip.

Starters of foundation are in use at the present time for inducing bees to build straight comb within the frame. With care, sound straight combs can be obtained where starters have been given, but, for a profitable brood comb, one built from a starter is not to be compared with one drawn out on a full sheet of foundation. The main idea in support of using starters in preference to full sheets is that they are cheaper, and that the colony is obliged to begin its comb by building worker cells on account of the starter being a strip of foundation comb, and that the bees once having built worker cells for about 2 inches of the depth of the frame, they will continue to build worker cells for a much greater depth. The patch of worker cells constructed in a comb built from a starter may reach nearly to the bottom bar of the frame in the centre of the patch, but as the comb grows downwards, the rows of worker cells will be shortened at both ends, the remaining space in the frame being filled with drone comb.

Occasionally under special conditions, a comb partly or entirely composed of worker cells can be obtained from a starter, but these conditions, when they occur naturally, are comparatively rare, not frequent enough to enable the apiarist to get a fair quantity of all worker comb built; similar conditions which will answer the purpose can be brought about artificially, but it is not very often convenient to do so. As will be explained, an all-worker brood comb is preferable to one containing patches of drone cells. The usual result of using starters in the brood chamber is too great a percentage of drone cells in the comb. But apart from its tendency to produce too many drone cells in the brood chamber, the brood frame fitted with a starter is not such a means of economy to a colony of bees as the brood frame furnished with a full sheet of comb foundation; the starter only extends for a depth of about 2 inches, leaving a deep vacant space below it, which must be filled with comb entirely at the expense of the colony. For this reason, starters prove more expensive than full sheets of foundation.

Drones and Drone comb.

Where full sheets are used in every frame, the percentage of worker cells in the brood chamber is practically as high as it is possible to get it; drone cells are few in number, consequently the number of drones the colony can produce from its brood chamber is small.

The drone, during the whole of his life from the time the male egg is laid until he is slaughtered or dies in any other way, is a tax on the stores and strength of the colony of which he is a member. The drone egg occupies space which could be better filled with a worker egg or stores; the larva hatching from the drone egg requires more food than a worker larva; a drone cell is occupied longer than the worker cell by the maturing bee, and finally from it emerges a male which feeds on the results of the labour of other bees. The full sheet of comb foundation used in every brood frame keeps drone-rearing in check to such an extent that, in place of a number of unprofitable males, the colony is producing a larger number of profitable worker bees. Full sheets of foundation do not entirely prevent drone comb being built in the brood chamber. There are spaces between the bars of the

frame and the edge of the sheet where the bees will find opportunity for building as many drone cells as are necessary to them.

For reasons which will be explained later, a limited amount of drone comb in the brood chamber is advisable, but full sheets of foundation can be freely used without fear of producing too few drones. Bees hived in an empty box and left to fend for themselves will produce large patches of drone comb and quantities of drones; at least one reason for this is apparent, the individual bee never considers its own special well-being before that of the colony to which it belongs. The success of the colony and the perpetuation of the stock long after the single bee is dead, is what this bee strives to ensure. The life of the colony is the main consideration. When the prolongation of the colony depends upon a virgin queen who has still to mate and start egg laying, there is some risk of her failing to mate. In order to ensure the fertilisation of virgin queens, colonies of bees will raise large numbers of drones, scores of which never meet with a virgin queen. In an apiary, which is a collection of colonies, the drone flight from the whole of the colonies, even when full sheets of comb foundation have been freely used, is quite strong enough to ensure the fertilisation of all the virgin queens that fly from the hives.

A few bee-keepers have objected to the use of comb foundation, thinking that a fertile queen is impaired when her cell laying is confined to worker eggs only. In place of depositing 500 male eggs, a queen bee can lay the same number of worker eggs with no extra strain. What the queen produces of herself, and what may tax her strength, is a male egg (unfertilised); the change in the egg from male to female is brought about mechanically, and does not tax the endurance of the queen. A newly mated queen bee is supplied with so many thousand male germs that she can fertilise from two to three thousand eggs daily for two seasons and a portion or the whole of a third season before exhausting the supply.

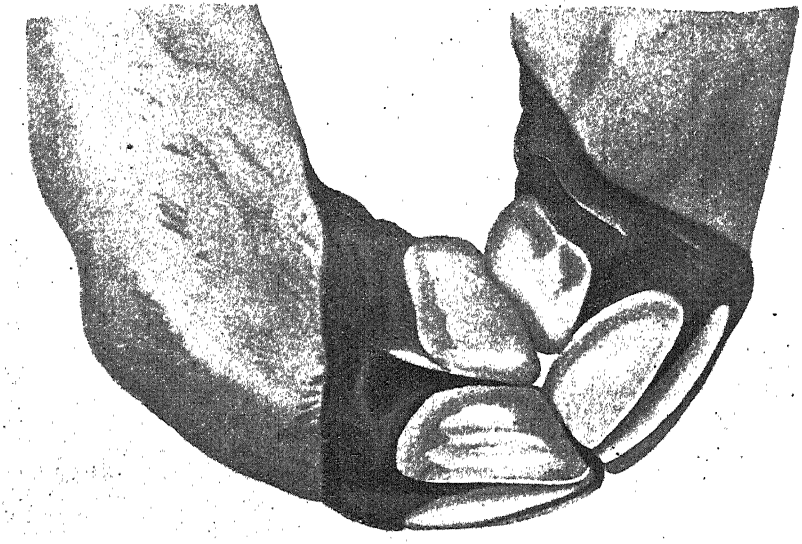
Bur comb and Brace comb.

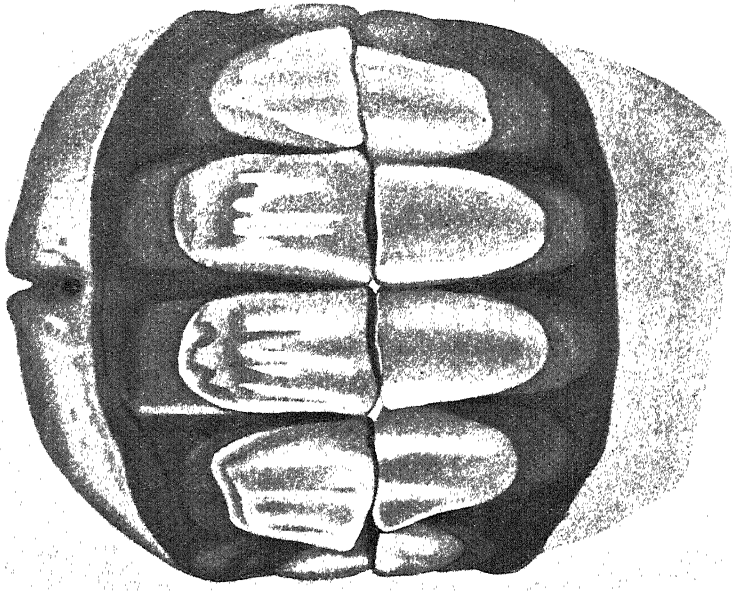
"Bur comb" and "brace comb" built by bees for joining and strengthening fixtures in the hive, are often excessive and generally a nuisance. As has been explained, bees naturally wish to build more drone comb than a very free use of comb foundation allows them to do, and if prevented from building drone comb to too great an extent, they are often inclined to satisfy their desire for drones by building too much bur and brace comb. To allow the colony to rear a limited number of drones is not detrimental, but the combs in which drone brood is to be reared should be the two outside or store combs of the brood chamber. Frames with only a half depth sheet of foundation could be given colonies for building store combs; they will then be able to rear a limited number of drones, and, if the colonies are relieved as often as possible of their honey, the inclination of the bees to build bur comb and brace comb will not be so strong. The value of a colony of bees depends much upon the breed of the bees, but its value is again very much enhanced if the brood combs in its hive are built on carefully prepared frames.

The Teeth of the Horse and its Age.

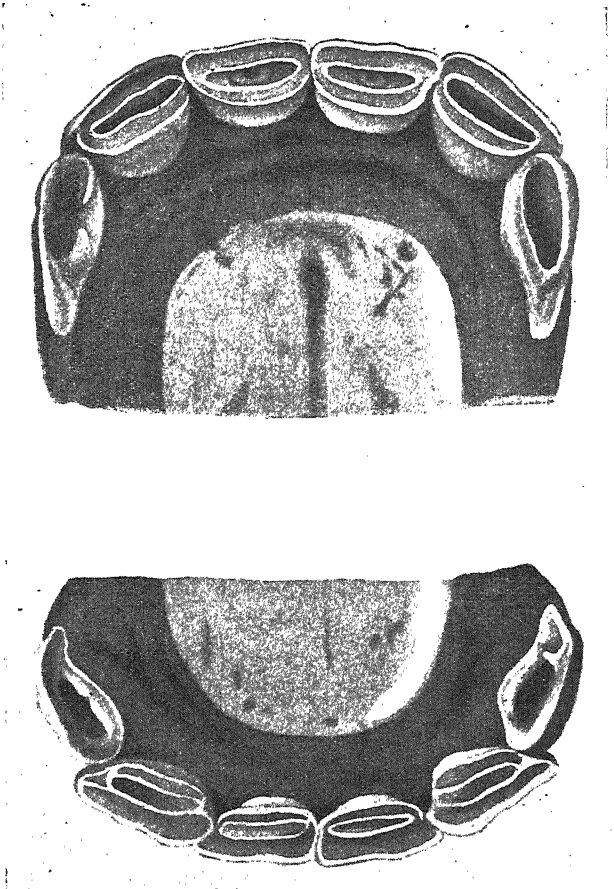
[Continued from Vol. XXIII, page 681.]

Compiled by the Veterinary Officers of the Stock Branch.





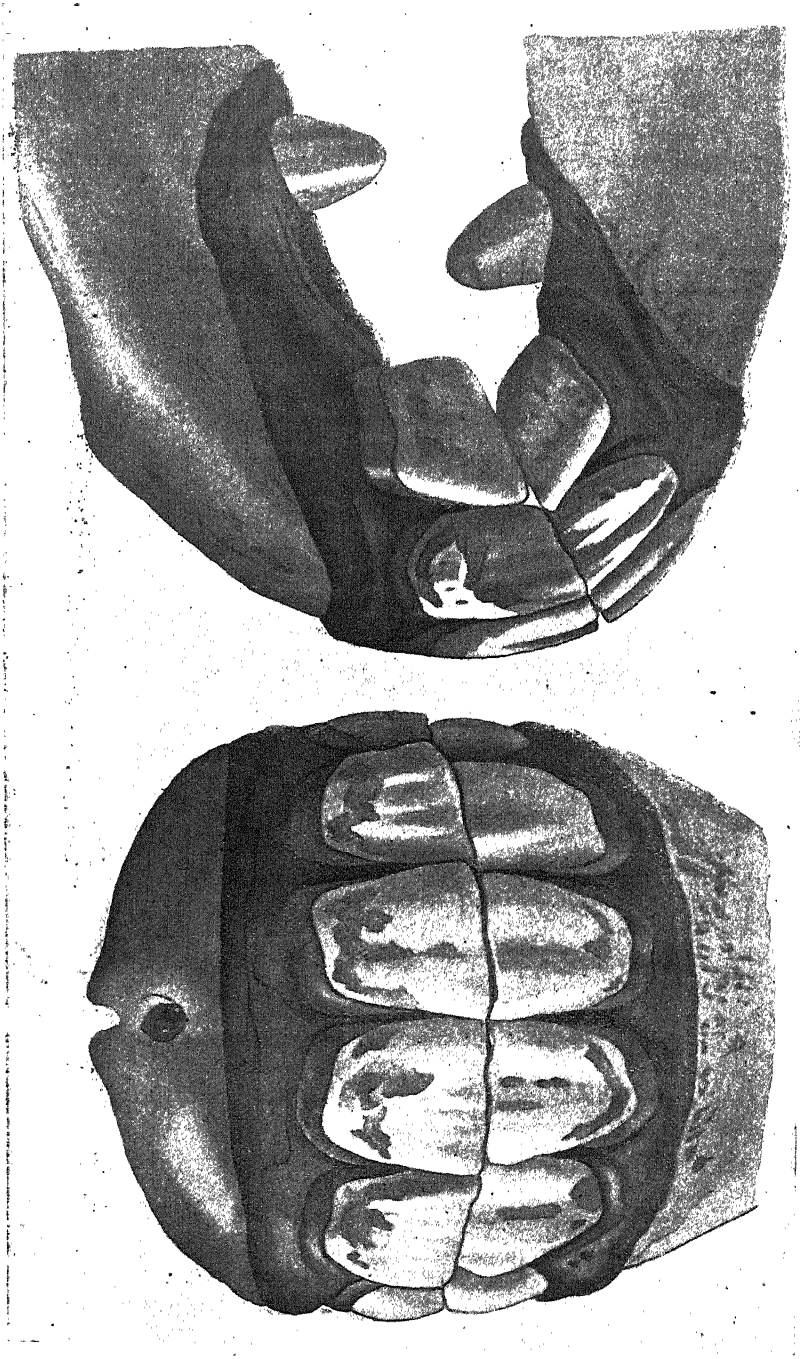
RISING FIVE YEARS.



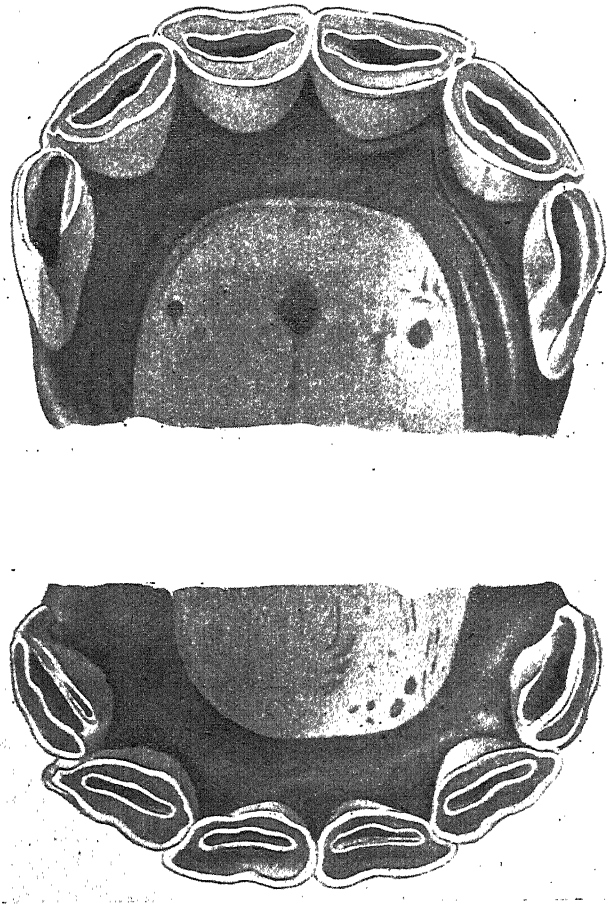
MOUTH RISING FIVE YEARS.

[*After Goubaux and Barrier.*]

The four milk corners have fallen out and are replaced by the permanent teeth. They are not on a level yet with the lateral incisors. The tables of the other teeth show more wear than at the preceding age.



FIVE YEARS.



MOUTH AT FIVE YEARS.

[*After Goubaux and Barrier.*]

At five years, the mouth is entirely made. All the permanent teeth are on the same level in their respective jaws, although the inner edges of the corner incisors have not yet come into use. The tushes are now well developed.

The Use of Lime-Sulphur.

C. P. SCRIVENER, Kookootonga, Mount Irvine, Bell.

[The views expressed here are no doubt the result of experience gained locally, but at the same time, they may require a great deal of modification for general purposes.—ED.]

LIME-SULPHUR concentrated mixture for orchard work combines all the good qualities of Bordeaux mixture without its bad ones, as well as being a splendid insecticide. It can be used for most diseases in apples, pears, stone fruits and citrus trees with better results than can be obtained from any spray so far introduced.

The writer can say from actual experience extending over some years, and treating about 20 acres each season, that lime-sulphur, with arsenate of lead added for codlin moth, and an autumn spray of red oil for woolly aphis, will for practical purposes eradicate most pests affecting apples and pears and keep all others under control. This can be done at a lower cost, without injury to the tree or fruit, than with any other spray. The only factors that make or mar success are care in preparation and thoroughness in application, with the abandoning of the old mist-spray idea. Mist sprays do not hit hard enough and in practice cannot be applied as theory states they should be for best results.

With a Bordeaux nozzle, a high pressure, and care taken to cover every part of the tree with lime-sulphur mixture, disease vanishes.

The idea in most orchards is to check disease, but this is not enough; the aim must be to eradicate all pests. To do this, more frequent spraying is necessary than the average grower uses. The aim must be not to see how few sprays can be used and still keep pests in reasonable check, but to spray so systematically that pests have no chance at all to exist.

Lime-sulphur cannot be used on a large scale unless made at home, as the price for the bought article is too high. Home-boiled lime-sulphur can be prepared in a concentrated form for a few pence per gallon and keeps indefinitely.

To prepare, take 29 gallons of water and bring to nearly boiling point in a 50-gallon iron boiler; then put in 33 lb. of best stone lime and stir till slacked; add 66 lb. of ground sulphur (not flowers), which has been passed through a fine sieve to remove all lumps and is mixed into a paste with 6 to 8 gallons of hot water. Stir for a few minutes and keep boiling fast till cooked. No further stirring is necessary. It cooks in 40 to 60 minutes, when all free sulphur will be dissolved. When boiled, make up to 36 gallons and put into either air-tight or open casks. In the latter case pour a little oil over the surface to keep out the air.

Make the mixture up a few weeks before it is decided to use it, as it will not burn the person using it nearly so much as when fresh boiled. In fact, if care is taken to grease the hands and face well, and if gloves and

a cloth mask without glass eye-pieces are used, little if any inconvenience will be experienced.

For winter strength, use 1 in 7 to 1 in 12; summer strength, 1 in 36 gallons of water.

Of course, where a considerable quantity is being used, it is desirable to get a Baume's acid hydrometer and use by tests. This does away with any guesswork and saves trouble.

For black spot, powdery mildew, canker, brown rot, anthracnose, red spider, San José, mussel scale, and woolly aphis in apples, apply once in winter at full winter strength, just as the buds begin to swell, and again with summer strength just as the flower buds pink out. As the petals of the flowers fall it may be again applied at summer strength, with 2 lb. of arsenate of lead paste or 1 lb. of arsenate of lead powder to every 50 gallons for codlin moth. A further spraying may be made with lime-sulphur and arsenate of lead when the apples are the size of marbles; again three or four weeks later; then in January of February, according to whether the variety is early or late in ripening; again as soon as the fruit is picked, omitting the arsenate of lead. This final spray is for anthracnose, a most dangerous pest not often known by name to growers, although its effects on the trees are very apparent. Spray with red oil, as soon as the leaves fall, for woolly aphis.

For black spot in oranges and lemons lime-sulphur 1 in 16 to 1 in 20 gallons of water works wonders, besides killing numerous other pests. This needs to be done before and after every fresh growth. If "Dicky Rice" are bad, add arsenate of lead to the mixture.

Where brown rot is a pest in plums and peaches, apply lime-sulphur two to three weeks before picking, using 1 in 36 to 1 in 40. This will check the disease even if it has started on the fruit.

Above all things, use care in weighing all ingredients when making the concentrated mixture, and make in as large lots as possible. Never have the boiler so fixed that it is subject to sudden changes in temperature, as this will cause failure to secure a good mixture, free of sediment. You can either use the concentrated mixture by drawing off the dark amber-coloured fluid, or mix in the light sediment, straining carefully when putting into the spray tank. I prefer to mix in the sediment and strain into the spray tank in the right quantities, as it seems to stick better and give better results this way. Measure concentrated mixture very carefully into spray tank, especially for summer use, as a little too much will cause the foliage to be scalded. Even if this should happen, the foliage soon recovers without any very serious results, unless the operator is grossly careless in measuring out the quantities. You can apply in hot or cold, moist or fine weather, as long as the trees are not wet.

When arsenate of lead is added, do not let the mixture stand longer than is necessary, and always add the arsenate in a fair bulk of water to the broken down mixture, and never to the strong concentrated stock solution. Also never put into copper vessels, and always clean out pump after use and oil it well.

One man can easily get wood and make up 144 gallons of the concentrated mixture per day with a 50-gallon boiler. This amount would take 264 lb. sulphur and 132 lb. lime.

	£	s.	d.
264 lb. ground sulphur at 11s. per cwt. ..	1	5	9
132 lb. lime at 1s. 6d. per cwt.	0	1	9
Wages, one day at 8s.	0	8	0
	£1	15	6

Thus the cost per gallon is less than 3d., without allowing for freight on materials.

The writer believes that by using a power pump with a pressure of 180 to 200 lb., lime-sulphur will eradicate woolly aphis without the aid of red oil, but on this point the experiment has only been tried for a short period. Up to the present results quite come up to expectations.

Liming Land.

In reply to a correspondent as to the use of unslacked lime, contrasted with the spent lime from tanneries, &c., Mr. F. B. Guthrie, Chemist, stated :—

The nature of the lime used depends upon the purpose for which it is required. Lime is applied to the soil for the following objects :—

(*a*) To lighten heavy clays.
(*b*) To sweeten sour soils.
(*c*) To supply plant food.

In the first case, either unslacked lime (powdered quicklime), or quite freshly slacked lime is the most effective, the action on the clay being both of a mechanical and chemical nature, breaking up the colloidal clay particles when the lime is slacked in contact with the clay. Slacked lime is much less effective, as the action is only a mechanical one, as there is no combination of the lime with the silicates of the clay.

The quicklime can be applied just as effectively in the form of a fine powder, when it will slack on becoming incorporated with the soil, and in the process of slacking it renders the clay friable. The reason it is recommended to slack the lime in heaps on the field is that quicklime in lump costs less than powdered quicklime, the process of stacking costing nothing; also, because the powdered quicklime soon becomes slack on exposure to the air, and, if obtained from a distance, will probably be no longer quicklime.

In the case of (*b*) either quicklime, slacked lime, or carbonate of lime (chalk) can be used, or the residual lime from tanneries, or from acetylene generators, or any similar form. In the case of (*c*) all the above are effective, also a substance like gypsum (sulphate of lime), phosphate of lime, &c.

With regard to the use of spent lime from tanneries as a substitute for quicklime, it will be found that this lime will not slack (become hot on adding water), and thus will not satisfactorily replace quicklime if the object be to break up stiff clay, but it is a suitable substitute, if required, for purposes (*b*) and (*c*). It undoubtedly is effective in lightening stiff clays, but less effective than quicklime.

Further information on the subject will be found in "Farmer's Bulletin No. 16" (Manures and Manuring).

Seasonable Work for Poultry Keepers.

JAMES HADLINGTON.

NOVEMBER.

THE hatching season should now be over in all but the very coolest districts of the State, where it may be prolonged into this month. Experienced poultry-keepers recognise the futility of hatching late, but the beginner is always more or less tempted to continue hatching long after it is advisable to do so, with the result that he encounters all the troubles incidental to late-hatched chickens, and is not infrequently so disheartened with his attempt at chicken-rearing that he gives it up in despair, not recognising that his troubles are of his own making. Late-hatched chickens are like a late crop—make but a poor stunted growth, and lack constitution; therefore, become an easy prey to roup, chicken-pox, and other troubles that are the bane of the poultry-raiser during the late summer and autumn months. They not only contract these maladies themselves, but are a source of infection to the earlier and more robust stock. Late chickens make but poor layers at the best, and are scarcely ever fit for the breeding pen.

Keep the chickens Growing.

The early-hatched chickens will now be feathering, and will need all the care and attention that can be bestowed upon them. Development is one of the main factors determining the profitableness of the adult bird. Good robust development is quite as essential as good breeding. Pedigee, strain, or the record-making abilities of their ancestors will avail little if good development is not secured. To obtain this, good feeding and environment are the main factors. By good feeding is meant, not alone feeding with sound feed, containing all necessary elements for the building up of the body and its requirements, and not merely cramming the chickens with as much feed as they will eat at given intervals, but skilful feeding, that keeps the chickens always on the alert for what is coming next. The growth of the chickens is just as easily stunted by surfeiting them with feed as by under-feeding. Keeping the food always before them, as in one method of feeding, is certainly much better than careless or unmethodical feeding at intervals; but the best development is obtained by feeding a little and often, and plenty of variety within the materials they are accustomed to.

Environment, too, plays a big part in securing good development. If the chickens are confined to small, bare yards, without inducement to work and exercise themselves in some way, a poor, stunted growth and a weak constitution will be the result. Many ways of keeping the chickens busy will readily suggest themselves to the intelligent poultry-keeper, such as burying

the feed in litter, or giving them earth to scratch in, or something to pull and run after. Change, too, is the very life of the chickens; if they have not the advantage of free range, it is of the utmost importance that they be moved about often from one place to another, if possible with different surroundings. It is surprising how soon chickens become "stale," if confined to one set of quarters with the same surroundings for any length of time. More particluarly is this the case after they are ten to twelve weeks old. Neglect to carry out what is above indicated is very often an unsuspected cause of heavy losses in rearing, and the trouble is oftener than not put down to some obscure disease, whereas want of progressive development was the trouble.

Encourage early Roosting.

A great deal has been said and written upon the evils of chickens roosting early; crooked breastbones and other deformities have been said to result from it. This has had the effect of deterring poultry-keepers from encouraging the chickens to roost early enough. I have not found these allegations borne out by my experience. The use of a 3-inch flat perch will obviate any ill effects that would be likely to arise from early roosting. After they get six weeks old, the sooner they take to the roosts the better. By encouraging them to roost early, you avoid that bane of all chicken-raising, crowding together in the corners of their quarters, breeding disease. Nothing will so quickly bring on colds and roup. It should also be remembered that cold, draughty quarters will induce them to crowd together for warmth; therefore, for chickens up to half grown, fairly warm houses, not too large for the number being put in, and well ventilated, give the best results.

Thin out the Chickens.

Thinning out chickens as they grow is a matter not to be neglected. If the quarters are anything like filled when the chickens are put in, a close watch will be necessary to prevent overcrowding, and the houses or other quarters should be systematically inspected at night to see that no overcrowding is taking place. These are some of the small but vital details which have to receive close attention to prevent undue losses, and to secure that robust development necessary to profitable poultry raising.

A Cone-forming Caterpillar.

A correspondent forwards for identification three "cones," which he had found on an apricot tree, as though they had grown there.

Mr. Froggatt, Entomologist, reports that the specimens submitted were the cocoons of the stinging caterpillar of the Brown Cup moth (*Doratifera vulnerans*). These slug-like caterpillars feed upon the foliage of gum-trees, but on several occasions have been found feeding upon apricot leaves. The cocoon is a wonderful structure, as it is formed with a circular lid, which the perfect moth loosens and pushes off when ready to emerge.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

Branch.	Honorary Secretary.
Albury	Mr. J. D. Lankester, Albury.
Baan Baa	Mr. P. Gilbert, Baan Baa.
Balldale	Mr. H Errington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Batlow	Mr. A. C. Arnot, Batlow.
Beckom	Mr. S. Stinson, Beckom.
Bonville	Mr. H. B. Faviell, Bonville.
Borambil	Mr. H. A. D. Crossman, "Homewood," Quirindi.
Bungalong	Mr. E. Hughes, Oakleigh, Cowra Road, *viâ* Cowra.
Cardiff	Mr. F. B. Cherry, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Collie	Mr. C. J. Rowcliff.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coradgery	Mr. G. C. Harris Wallandra, Parkes.
Coreen-Burraja	Mr. N. B. Alston, Coreen, *viâ* Corowa.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Deniliquin	Mr. W. J. Adams, jun., Deniliquin.
Derrain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Erudgere	Mr. Frank Hughes, Erudgere.
Fernbrook	Mr. W. Marks, Yarrum Creek, Dorrigo
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Gerringong	Mr. J. Miller, Gerringong
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. W. Smith, Henty.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jerrara	Mr. A. O. Lane, Public School, Mullengrove, Wheeo.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Jindabyne	Mr. Sylvester Kennedy, Jindabyne
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit, *viâ* Manilla.
Kellyville	Mr. C. F. Boughton, Kellyville.
Leech's Gully	Mr. J. T. Weir, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Portland	Mr. W. C. Gambrill, Lower Portland.
Mangrove Mountain ..	Mr. G. T. Hunt, Mangrove Mountain, *viâ* Gosford.
Martin's Creek	Mr. P. Laney, Martin's Creek, *viâ* Paterson.
Middle Dural	Mr. H. Porter, Middle Dural.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Moruya	Mr. P. Flynn, Moruya.
Narrandera	Mr. C. F. Pearce, Narrandera.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
New Italy	Mr. F. A. Morandini, New Italy.
Nimbin	Mr. J. H. Hutchinson, Nimbin.
Orangeville	Mr. C. Duck, Orangeville.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkesbourne	Mr. W. H. Weatherstone, Parkesbourne.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose-Kareela	Mr. L. Pieremont, "Vila," Penrose.
Redbank	Mr. J. A. Graham, Woodlands, McAlister, *viâ* Goulburn.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria Streets, St. Mary's.
Sackville	Mr. Arthur Manning, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Stockinbingal	Mr. J. Neville, Stockinbingal.

Branch.	Honorary Secretary.
St. John's Park	Mr. J. C. Scott, St. John's Park.
Tallawang	Mr. J. E. Hansall, Tallawang.
Taralga	Mr. Dave Mullaney, Stonequarry, Taralga.
Tenterfield...	Mr. R. Livingstone, Tumbarumba.
Toronto	Mr. J. G. Desreaux, Esmond, Toronto.
Tumbarumba	Mr. R. Livingstone, Tumbarumba.
Upper Belmore	Mr. J. E. Garred, Upper Belmore.
Uralla	Mr. E. A. Neil, Uralla.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wollun	Mr. C. E. Burke, Private Bag, Wollun.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Wyong	Mr. Edgar J. Johns, Wyong.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Demonstrations in Clearing Land and Subsoiling with Explosives.

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. H. C. Coggins, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Veterinary Lectures.

In connection with the lectures to branches of the Agricultural Bureau, it is herewith pointed out for the information of honorary secretaries that the following is the list of subjects of lectures which can be delivered to them :—

Horses.—(1) Conformation and Unsoundness (with lantern illustrations); (2) Colic and Treatment of Wounds; (3) Strangles, Influenza, and Tetanus.

Cattle.—(1) Tuberculosis (with lantern illustrations); (2) Contagious Abortion and Contagious Mammitis; (3) Ticks, Tick Fever, Tick Infestation and Eradication.

Sheep.—Parasitic Diseases of Sheep.

Pigs.—Diseases of Pigs.

General.—(1) Parturition of Farm Animals (with lantern illustrations); (2) Feeding of Farm Animals and Dietetic Diseases; (3) Sterility: Causes and Treatment in all classes of Stock.

REPORTS AND NOTICES FROM BRANCHES.

Albury.

A lecture was delivered by Mr. H. C. Stening, Inspector of Agriculture for the Southern District, at Thurgoona, on 23rd September, there being a fair attendance.

WHEAT-GROWING, AND MANURING FOR WHEAT.

The culture of wheat from the early preparation of the soil to the harvesting of the crop was dealt with. Wheat-growers were advised to adopt the practice of fallowing as a safeguard against dry seasons. As an example of the success of fallowing, the district experiment plot at Jindera was quoted, where a yield of nearly 29 bushels per acre of Federation wheat was obtained on fallowed land with a rainfall of only 7½ inches during the growing period. The many advantages to be derived from fallowing, other than the conservation of soil moisture, were mentioned, and the best methods of cultivation explained, the necessity for summer cultivation of the fallow being specially emphasised. Mr. Stening enumerated the varieties suitable for the district, and recommended that seed-wheat should be graded and treated with bluestone solution for the prevention of bunt. He also explained the best time to sow and the depth and rate of seeding, and advocated feeding off with sheep when too vigorous a growth was made early in the season.

The lecturer went on to define the object and value of manuring the wheat crop, also the necessity of supplying phosphoric acid. Examples of the efficacy of superphosphate in increasing the wheat yield were given, and an increase of 11 bushels per acre in the experiment plots at Germanton, as the result of an application of 56 lb. of superphosphate per acre, was quoted. Another important soil constituent, of which the lecturer said wheat lands were frequently deficient, was humus. In order to restore humus to the soil, it was advised that fodder crops should be grown and fed off, the plant residues and droppings being ploughed in.

Balldale.

Mr. H. C. Coggins, Assistant Inspector of Agriculture, gave a very interesting and instructive demonstration and lecture on the 1st October. There was a splendid attendance, some farmers and orchardists from Victoria being present; in fact, one gentleman came 90 miles, and several travelled from Ringwood, 30 miles away.

TRIAL OF EXPLOSIVES IN SANDY SOIL.

After a close examination of the soil, Mr. Coggins explained that explosives in this particular part of the district would prove of very little benefit, as the soil was of a sandy nature, being too loose to offer much resistance to the explosive. He demonstrated the fact and his meaning by boring well underneath a box-tree, charging the holes with gelignite, and firing all the charges together by an electric battery. The result of the explosion was that the tree still stood, but all around and under it the sand had been blown away, indicating that there was want of resistance in the sand, and that the subsoil was too deep to afford a satisfactory "kick-off."

It was explained that under ordinary conditions, such as prevail in most parts of the State, explosives in agriculture will prove of great value to the man on the land, both as regards time and money, and, in reply to a question, it was stated that, provided a person used ordinary care and intelligence, gelignite and also the detonators were perfectly safe to handle.

Mr. Coggins gave a demonstration of subsoiling, and spoke at some length regarding the nature and character of soils and subsoils, illustrating where it is necessary to subsoil, the reasons and the advantages, his remarks being listened to with close attention. At the conclusion of the demonstrations a vote of thanks to Mr. Coggins was carried.

Borambil.

A demonstration of handling bees and using the Modified Bolton hive was given to the members of the Borambil (Quirindi) Branch on Thursday, 2nd October.

The frames for the hive were nailed together, wired, and each fitted with a sheet of comb foundation, and the advantage of the hive for controlling swarming and keeping the brood-chamber clear of honey during a flow was clearly shown. The foundation roller and the wax tube were both used for fastening the sheets of foundation.

Whilst handling bees in Mr. Pengelly's apiary, where the demonstration was given, several combs were found without wires running through them, and advantage was taken of this to demonstrate the use of wired combs, especially in hot weather.

Cardiff.

A meeting of the Cardiff Branch was held on Saturday evening, 13th September, when there was a good attendance of members.

The Fruit Cases Act was discussed, some members expressing the opinion that the specified half-bushel case was unsuitable for fruit in their district, as there are a large number of peaches with which it will be impossible to get two layers in a case.

A paper on "The best method of disposing of the local fruit" is to be read at the next meeting by Mr. Minslow.

A demonstration of clearing and subsoiling with explosives was given by Mr. H. C. Coggins, Assistant Inspector of Agriculture, on 24th September, before about sixty farmers.

A spotted gum tree, 2 feet 6 inches in diameter, was removed in a very short time for an outlay of 5s. for explosives, whereas practical men estimated the cost of grubbing by hand at 16s. to £1. The subsoiling work also proved very instructive to members present.

Carlingford.

The following paper was read by Mr. F. C. Jackson at a recent meeting of the above branch:—

The Corn Club Movement in America.

In 1909 agricultural education in America was greatly stimulated by the introduction of maize-growing competitions into the schools of the Southern States.

The objects of the movement were (1) to substitute modern methods of farming for obsolete ones, and (2) to stop the increasing exodus of rural youths to cities, by making farming life pleasant, and demonstrating its enhanced profit under new conditions.

The following table shows the growth of the movement:—

Year.	Number of Members.
1909	10,543
1910	46,225
1911	56,840
1912	60,000

The system differs from the school gardens to which we are accustomed in Australia, chiefly in that each member of a corn club cultivates one acre of maize *at home* on his father's land or on rented ground, and keeps continuous records of his operations and expenditure, &c. At the end of the season his acre is inspected, and prizes are awarded on the following basis:—

	Maximum points.
(*a*) Greatest yield per acre	30
(*b*) Best exhibit of 10 ears	20
(*c*) Best written account, showing history of crop	20
(*d*) Best showing of profit on investment, based on the commercial price of corn	30
Total	100

The boy whose land and labour produce the greatest yield does not necessarily win a prize, as the cost of labour, fertilisers, etc., may have been so great as to make the farming unprofitable. Every boy in a corn club must exhibit at the local show; or if there be no show in his village or town, then a school show is held, which often proves the origin of an annual district show.

An essay must be submitted, describing the season's operations, since every boy should be able to express in good English the reasons for the various operations he performs, and he should be able to record his observations in a scientific manner and to discuss agriculture intelligently.

The competitor must furnish a financial statement of the season's operations. The market value of his crop represents his receipts, against which he has to charge £1 for rent of land (even if his father gives him the use of it free), 5d. for every hour he works, 2½d. for every hour he uses a horse, 4s. 2d. for every load of manure (even if he gets it for nothing), and whatever commercial fertilisers he uses at market price. Unless he can show that his method would pay in farming on a large scale, then he has little hope of winning a prize, no matter how high his yield may be.

No difficulty is experienced in America in obtaining valuable prizes from Chambers of Commerce, Boards of Trade, railroads, banks, and commercial men generally, who are only too anxious to increase the maize yield, knowing full well that by so doing they are stimulating commerce generally. The State Governors issue diplomas to all boys having a yield of at least 73 bushels to the acre, at a cost not exceeding 1s. 3d. per bushel, and the first prize-winner of each State is sent, at the Government expense, to Washington for one week, where he (in company with the champions of the other States), is the guest of the Federal Government. These boys are shown everything of interest in the Federal capital, especially that which pertains to agriculture.

Prizes to the value of £8,000 were awarded in 1910, and to the value of £10,000 in 1911.

These corn clubs are operated by various Government departments, which are correlated for the express purpose. The arrangements vary slightly in different States, but in all of them the Federal Department of Agriculture assists financially, allows its experts to give advice, and issues bulletins and circulars to every boy in the movement, advising him how to treat his crop from time to time.

The best scheme I can find is that afforded by Virginia, where a board, created by legislation, correlates the College of Agriculture and Polytechnic Institute, the Agricultural Experiment Station, the Commissioner and State Board of Agriculture, and the Federal Department of Agriculture, for the management of these clubs.

The scheme is becoming very popular in America in the Southern (agricultural) States, and it is arousing great interest, as the boys are showing that the agricultural output of the State can be doubled by the adoption of modern methods. Many farmers who have stubbornly followed conservative methods

have at last been converted to the new gospel of agriculture by seeing what their own boys can do on one acre.

The following statistics for 1912 show what is being accomplished by American boys:—

State.	Enrolment.	Number making final reports.	Average yield per acre on Boys' plots.	Yield on similar lands.	State Average for 1912.*
			bus.	bus.	bus.
Alabama	10,000	1,386	60¼	16⅓	17·2
Arkansas	2,675	364	47⅞	21¼	20·4
Florida	1,200	179	37¼	7⅜	13·0
Georgia	11,400	2,100	54½	13½	13·8
Louisiana	2,125	200	53½	19½	18·0
Mississippi	4,825	1,500	64¼	17¾	18 3
North Carolina	3,200	635	60⅜	19¼	18·2
Oklahoma	6,200	325	46½	21⅜	18·7
South Carolina	2,200	400	66⅓	17⅜	17·9
Tennessee.	2,600	731	88½	34½	26·5
Texas	10,375	289	36⅜	23¼	21·0
Virginia	2,250	600	57½	19¼	24·0

*Year Book of the Department of Agriculture, 1912.

Collie.

About fifty members attended a lecture on "Foaling," which was delivered at Collie by Mr. S. J. Gilbert, M.R.C.V.S., on 9th September.

Coonabarabran.

The usual monthly meeting of the branch was held on the 6th September, there being a very good attendance of members.

It was decided that the seed maize purchased by the branch from the Experiment Farms be sold, in lots of 5 lb. only, to members until next meeting; any balance then remaining to be disposed of in lots as required.

Mr. T. Hutchinson read the following paper:—

Parturition in Farm Animals.

Normal Parturition.—When the time has arrived for the birth of the fœtus, the membranes covering it become detached from the walls of the uterus, enter the mouth of this organ, pass into the vagina, and protrude from the lips of the vulva. In the meantime, the nose and head of the fœtus resting on top of the two fore-legs pass through to the vagina in the same way; at the same time the labour pains, commonly called "throes" with stock, become more marked, the uterus contracts, and with the aid of the contraction of the diaphragm and muscles, the fœtus is expelled, and all is well.

Abnormal Parturition.—All persons who have anything to do with cattle are, or ought to be, well acquainted with the manner in which a calf should present itself when in a natural position. All positions are called unnatural in which a calf presents itself otherwise than with the head and fore-feet first, and its back towards the mother's back. It is well known to all who have to do with cattle, that calves are commonly presented in a variety of different positions for which no just reasons can be assigned, and then both cow and calf are in danger, and more or less depends upon the ability of the person employed to give the necessary assistance.

In the first place, then, after the waters are broken, if only one foot presents itself, you must lay hold of the calf's head, and wait till the throes are off; then gently push it back, and rectify the other foot, after which the fœtus may be extracted without danger.

If the head only presents itself and both feet are left behind, the head must be pushed back with a gentle hand as soon as the throes are off, and

the feet properly placed; this must be done with the utmost care lest you wound the uterus.

If all four feet are turned where the back ought to be (towards the top of the uterus), it will be impossible to extract the fœtus until it is placed in a proper position. In operations of this kind, everything depends on the activity and cleverness of the person employed in placing the beast in a favourable position. The hind parts of the cow must be sufficiently raised with straw, or bags filled with straw, which would be easy to lie on, properly placed under her. By these means the attendant will be much assisted in putting the calf in a suitable posture for extraction, and then, on the return of the throes, or pains, giving nature his best assistance.

Should the hind legs present themselves first, it is always better to extract in this position, rather than to try and turn them.

Instances often occur of the calf being dropsical in the head. This may be known by the largeness of the head, in which case the other parts are generally small and wasted away. Under these circumstances, if the calf cannot be extracted in the ordinary way, the best method is to fix a cord around each foot, as well as the upper or under jaw, and assist when nature endeavours to do its work. If, however, the calf be dead, it may be cut away in parts, but great care must be taken, as it is easy to take the cow's life.

Lastly—a thorough sterilisation of the operator's hands and all instruments must be effected with some good disinfectant before commencing to operate.

Discussion.—Replying to questions, Mr. Hutchinson gave a description of the knife to be used, also how to use the rope and hook in cases of very difficult abnormal parturition.

Dr. BARTON was of the opinion that the hook was dangerous, more especially in the hands of an ordinary farmer, and recommended the use of the rope with a half-hitch. He pointed out the necessity of thorough cleanliness and use of disinfectants in all cases.

Mr. COPELAND supported the previous speaker in regard to cleanliness, and suggested the use of plenty of oil on the operator's hands and arms, as it both assisted the operator and gave ease to the animal. He had found the same abnormal positions occurred in horses, cattle, and sheep. With retention of the after-birth he recommended a good purgative drench (given by the mouth, and not, as often is done, through the nostrils). The membrane may require to be removed, and this must be done carefully by passing the hand between the membrane and the walls of the organ, followed for a day or two with a good disinfectant wash to prevent inflammation.

Mr. HAGAN asked was it better to allow a cow to lie down or swing after an operation? Mr. HUTCHINSON said it was better to swing with the hind part a little higher than the fore part.

Dr. FAILES recommended members to thoroughly investigate in all such cases. He had known a man lose a valuable mare owing to retention of after-birth, which might have been saved by an investigation in time. The farmer should not be afraid in any abnormal case to find out the position of the young, and endeavour to place it in a normal position for presentation; but find out definitely what is the matter before attempting to assist.

Mr. HUTCHINSON said at times it was absolutely necessary to use the knife to save the mother's life, and in careful or expert hands there would be little danger of an injury to the mother.

Mr. J. W. Nelson had prepared a paper on "Poultry-rearing," but owing to the lateness of the hour it was decided to hold it over for discussion to next meeting. Mr. Hagan promised a paper on "Haymaking."

The meeting closed with a vote of thanks to Mr. Hutchinson.

Coradgery.

At the monthly meeting, held on 13th September, there was a good attendance of members. Mr. W. R. Birks, B.Sc., Inspector of Agriculture, was in attendance, and at the request of the President explained the conditions connected with the Department's experiment plots, and also gave valuable hints for conducting the branch so as to gain the maximum benefits for members.

Messrs. H. N. Marriott, Kelk, and Tayler were requested to prepare a paper on "Eradication of Black Oats," to be read at the next meeting.

Much enthusiasm is shown by members, and particular satisfaction at the prospect of having experiment plots established in the locality by the Department.

Coreen-Burraja.

A meeting of the above branch was held at Mr. Leighton's farm on the 13th September, when a most important question to all those engaged in agriculture was discussed, namely, "Does it pay to manure and fallow?"

Diverse opinions were expressed by those present, and a general discussion of much value took place.

Erudgere.

Mr. C. Pedersen, Dairy Instructor, delivered a very interesting lantern lecture on dairying to the members of this branch. The attendance numbered fifty-seven, and the lecture was much appreciated by all.

Mr. Pedersen stated that, generally speaking, the dairy stock was of fair quality, and with care should give a good yield; in fact, some of the farmers were apparently making 32s. per cow per month.

Fernbrook (Dorrigo).

The subject of growing Indian cane for fodder purposes was discussed at the meeting held on 10th September. Several members gave instances of farms where the canes grow well, especially in the second year, and act as a good stand-by for all classes of stock. A number of members intend planting trial plots this summer.

Forest Creek.

A demonstration of the use of explosives in clearing and subsoiling was given on Mr. Morgan's farm, on the 10th September, by Mr. H. C. Coggins, of the Department of Agriculture. About 100 people watched the proceedings with the keenest interest.

As all dead timber in the district is easily burned, while difficulty is experienced with green timber, a green red gum, about 4 feet in diameter, was selected, and Mr. Coggins stated that in such cases only sufficient gelignite should be used to shatter the tree (not to bring it down). In a very short time a tree shattered and left standing would be dry enough to burn well. This applied especially to red gum, which in a half-dry state would burn off without difficulty.

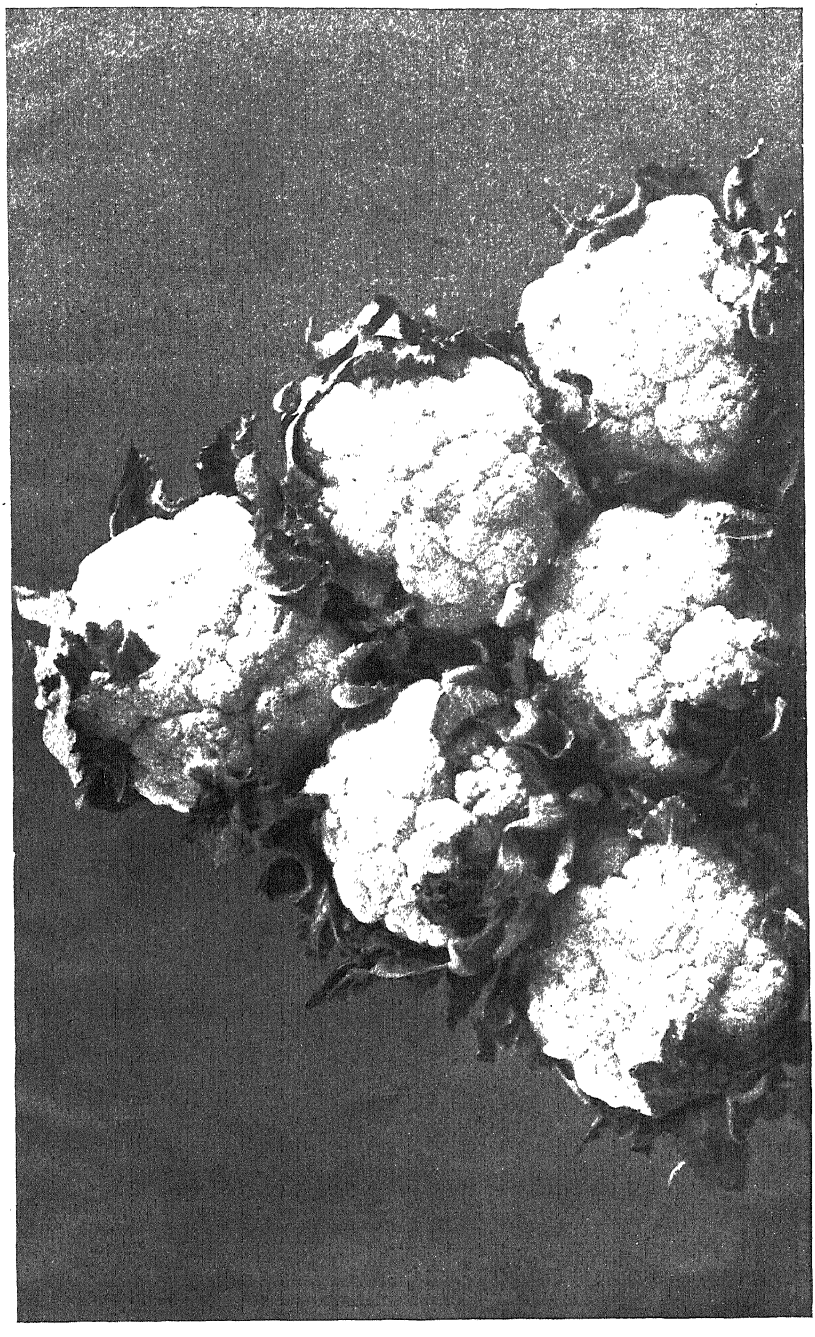
Henty.

The annual meeting of this branch was held on 30th August.

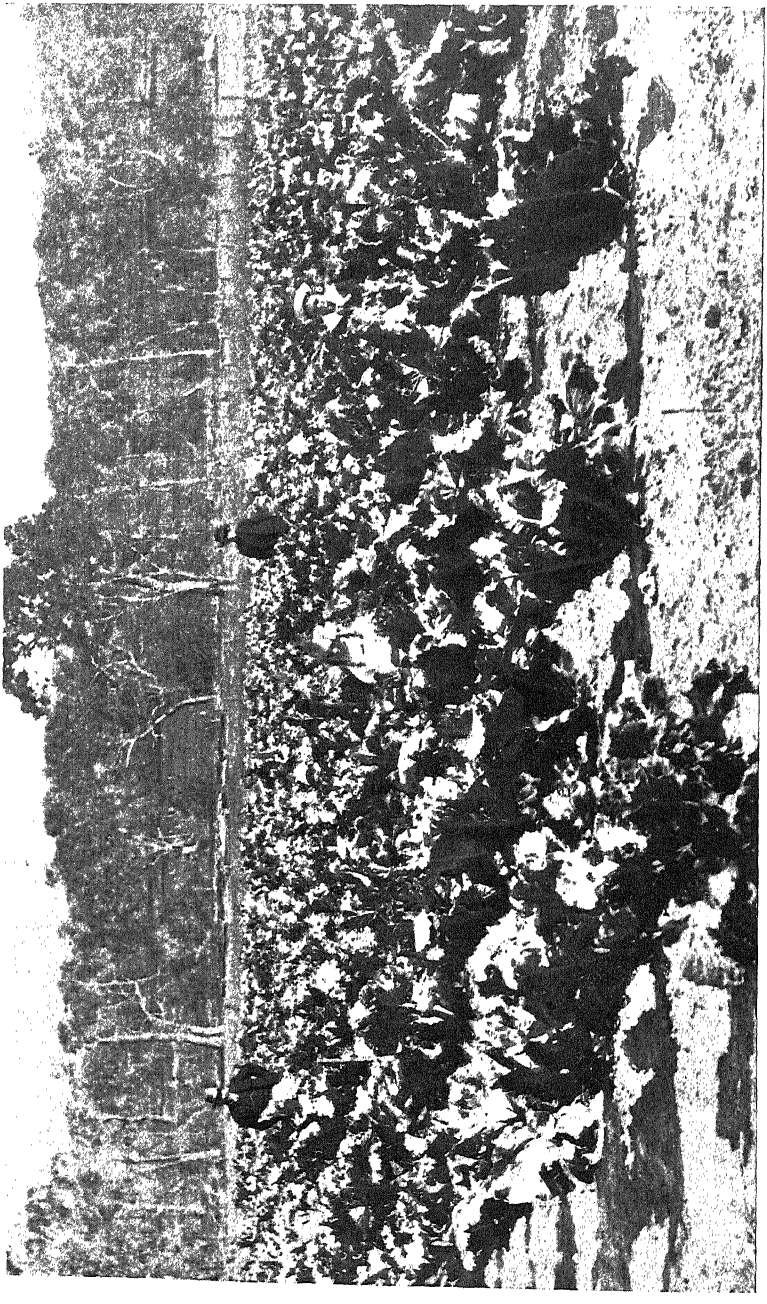
THE YEAR'S WORK

The Hon. Secretary reports that nine regular meetings were held during the year, and papers were read by members on "Small Silos," "Fallowing," "Bee-culture, "The Feeding of Farm Horses," and "Measurements on the Farm." Several lectures and demonstrations were also given by departmental officers. Thirty-one members were enrolled for the year, but a greater increase is expected as the advantages of membership become better known.

At the suggestion of the Government Entomologist, a collection of insects belonging to the district has been made by members, which will be classified by the Entomologist and returned to the branch for reference.



Cauliflowers grown by Mr. T. Kook, "Rock Mount," Inverell.
Watered by natural rainfall only. Weight, 20 lb. each.



Field of Cauliflowers at Inverell. Grown by Mr. T. Kook, "Rock Mount."

At the meeting an interesting paper was read by Mr. J. A. McKenzie, from which the following is extracted:—

PROSPECTS OF DAIRYING IN THE HENTY DISTRICT.

This very important industry is worthy of more attention than it receives in this district. I believe that returns equal to any other industry could be obtained if proper methods were adopted, such as careful selection of cows, growing of fodder, and co-operation in marketing of produce. I would like to compare the industry with the great wheat-growing proposition, by asking the wheat-growers what chance they would have of producing the amount of wheat they do now if they had to depend on the old varieties of wheat, such as White Lammas, White Tuscan, Port Macdonald, and others. In my opinion, dairying here is about at that stage at present. Other districts with a great reputation for cows and their produce, in many instances, are not fit for anything else, but in the majority of these places the winter is so severe that it is necessary to suspend operations, and it is then that this and similar districts should be able to put a lot of produce on the market.

With a varied experience of the industry, here and elsewhere, my idea, as it applies to this district, is that the bulk of the cows should be brought to profit in April and May. With ordinary seasons you will get seven or eight months' good return from them, and also secure good prices for the produce. The average man here tells you that it is too dry for milking. I know places in Victoria with a lighter average rainfall than this district has, and subject to the same wet period, where dairying has been carried on successfully for twenty-five years. One place in particular has gained the distinction of securing the highest price on the London market for Victorian butter on more than one occasion; as recently as 1912 was one of the occasions referred to.

A few cows would be found to be a very useful adjunct to those who confine the whole of their attention to wheat-growing, as a very simple system could be arranged to market produce. I would not advocate the building of a butter factory for a time, but the factories in existence would very likely arrange to have a waggon put on to collect cream if sufficient inducement offered. This system seems to give satisfaction in other places, and I do not see what should prevent it being successful here.

Later on it would very likely be found an advantage to start a factory, but, of course, that would be a large order for the present.

Discussion.—Mr. McKenzie answered a large number of questions, chiefly bearing on the storage of fodder against periods of scarcity. He expressed a preference for hay as compared with silage.

Mr. P. W. SMART said that over twenty years ago in the Goulburn Valley a few selectors round Tatura brought their can of milk to the station, and were laughed at. However, they went through a bad season, which shook the wheat-growers, and by-and-bye one milk cart became two, and wheatmen took up dairying on a lighter rainfall than round Henty. Tatura and Kyabram became prosperous through dairying. In the Henty district some already do well at dairying, and as land becomes more valuable dairying will become more general here. They had district experiences of dairying to bear this out, and his own impression was, from comparison with what had come under his notice elsewhere, that dairying could be profitably carried on for eight months in the year in the country immediately surrounding Henty.

A vote of thanks was accorded Mr. McKenzie for his paper.

Inverell.

The following paper was read at a recent meeting of the Inverell Branch by Mr. T. H. Kook:—

CAULIFLOWER CULTURE.

The first consideration in the production of cauliflowers is the nature of the soil. I would recommend a dark, rich, sandy loam. The soil I am growing them on here is a granite, sandy loam of darkish colour, with a yellowish, stiff clay subsoil running from about 9 inches to 1 foot in depth, giving a nice workable surface. The land should be selected and ploughed at least six months before planting, and if it can be ploughed earlier, so much the better, the ploughing being done to a depth of about 6 inches. After this it should be

cultivated at least once a month, until planting time, as this destroys pests, strengthens the soil by turning it over in the sun, and conserves moisture.

The next question is the manuring, which is a very important one. My method is as follows: I first of all mark two sides of the bed so as to get the lines for planting square and bring the plants in line each way. I use a measure 4 feet 6 inches long, to give me the exact distances apart. They do not want to be any closer when grown without irrigation. The pegs down each side give a straight start with the line, which is then put up, and one shovelful of earth removed just where the plant is to go. The manure is placed in that, and when the row is finished the line is removed to the next. I then go along with a shovel and dig the manure thoroughly into a depth of 1 foot, mixing well with the soil. I would recommend that the spot dug be about 18 inches in diameter and 1 foot in depth. When this is done a peg is placed in the centre of the spot. The manure should be in the soil at least six weeks before planting, so that if a wire peg is used it avoids the risk of losing the spot so prepared. A wheel-hoe can be used before planting to keep weeds down, and then when the plants are ready to go out, draw the peg and work the plant in. The manure I use is sheep manure from under a wool-shed grating. I find this is the best I can get, as all the strength is in it. I use one good shovelful to each plant. I also use a patent cauliflower manure, allowing two tablespoonfuls to each plant, but it must be very well mixed or it will burn plants when put out.

The best six months' variety to grow is the Sydney Market Favourite. In raising the plants, I keep them well dusted with tobacco dust when they come up to prevent pests from attacking them, for if the plants are put out clean, and this method of cultivation is followed, they will want no after-attention to keep pests away. The best time to sow this variety is in January, and transplanting can then be done in February. Cultivated and grown in this way they will stand a lot of dry weather. I have had as much as eighty days without rain, and have then cut cauliflowers 25 lb. in weight per head.

[Correction.—In order to find space for a paper on "Mixed Farming," which was read by Mr. J. Ditzell before the Inverell branch, it was divided into two instalments, one of which appeared in the June issue of the *Gazette*. The second portion of the paper was inadvertently placed under the heading of "Leech's Gully," and published in the August issue, page 717, to which several inquirers are directed.]

Jerrara.

A new branch has recently been established here, and at the meeting held on 16th September the following gentlemen were elected as office-bearers:—Chairman, Mr. A. Collins; Vice-Chairman, Mr. F. Brown; Hon. Treasurer, Mr. W. Collins; Hon. Secretary, Mr. A. O. Lane.

Jindabyne.

A meeting of the above recently-formed branch was held at Jindabyne on the 4th October, to hear an address by Mr. R. N. Makin, Inspector of Agriculture for the district. There were about twenty farmers present, which, considering unfavourable weather, was a good attendance.

The Cultivation of Fodder Crops.

The lecturer, in the first place, congratulated the farmers upon forming a branch of the Bureau in the district, and hoped that it would assume larger proportions, as it stood for agricultural progress in their midst. He had noted in travelling through the district that the soil formation varied. In parts it appeared to be very good, and little was required, perhaps, in the way of manures on the better class of soil, though the application of lime would, no doubt, be beneficial if it could be secured at a reasonable rate. The poorer classes of soil would, perhaps, benefit from the ploughing in of green leguminous crops, which would be a cheaper way of increasing fertility than the application of artificials, which, owing to heavy freight, were out of the question.

Of fodder crops, the cultivation of such as lucerne, rape, wheat, oats, and potatoes should receive most consideration, though he was well aware of the difficulties to be faced in regard to the climate. They might entertain the

idea of arranging for farmers' experiment plots in the district, so that some idea might be formed as to the suitability of different varieties of crops to the district.

Laying down of pastures was a matter for close investigation as to the most suitable varieties of grasses, and the methods likely to secure the best results. Rye grass, Cocksfoot, Kentucky Blue and Prairie grasses and clover were to be recommended. He considered it was a mistake to work the ground up into a loose condition preparatory to sowing Rye grass, as better results were obtained by sowing after scarifying the surface and then harrowing the seed in. *Phalaris bulbosa* might prove of some value, but at the present time the seed was too expensive for general sowing.

Rape was a crop that was deserving of more attention than was given it. Where suitable land was available it would be one of the most profitable crops that could be grown in the district for winter feed for sheep. The question of silage was worthy of serious consideration, as it was a profitable way of storing fodder, and helped to tide over severe weather. Oats would, perhaps, be a suitable crop to grow for the purpose.

Discussion.—Replying to questions, Mr. Makin said that from 4 cwt. of lime upwards should be applied per acre, according to the class of soil. How long Rye grass would remain in a pasture would depend largely on the class of soil in which it was sown and the treatment given. Under ordinary conditions it should stand six or seven years. An interesting debate followed, some farmers maintaining it would last longer than seven years, others that it would not last more than four years.

The meeting closed with a vote of thanks to the lecturer.

Kellyville.

The usual monthly meeting was held on the first Saturday in September. A good attendance of members was present.

The following gentlemen were elected office-bearers for the ensuing year:—Mr. H. Firth, Chairman; Mr. H. H. James, Vice-Chairman; Mr. D. Kearney, Hon. Treasurer; Mr. C. F. Boughton, Hon. Secretary.

To mark the close of the second year's operations, an enjoyable concert was held on the 23rd August.

The Year's Work.

Mr. C. F. Boughton, in forwarding his annual report, states that meetings have been held in every month and have generally been well attended. Officers of the Department lectured on "Natural and Artificial Incubation" and "Bee-keeping," and demonstrations in pruning were given by Mr. J. G. R. Bryant, Assistant Fruit Expert, and in clearing and subsoiling with explosives by Mr. H. C. Coggins, Assistant Inspector of Agriculture.

A visit to the Hawkesbury Agricultural College was also arranged during the year.

Notwithstanding the outside assistance and instruction received, mutual help enters largely into the plans of the branch, and addresses such as those given by Mr. Armstrong on "Fruit-growing," by Mr. H. James on "Budding and Grafting," and by Mr. H. Burton on "Rotation of Crops," must prove helpful to members. These, and the discussions which ensued, have stimulated thought, and led to a desire for increased knowledge and greater efficiency in the work that concerns farmers most.

Experiments with new varieties of wheat have been tried, and the quick-growing varieties, such as Florence and Thew, are shown to be worthy of further trial.

Leech's Gully.

At a meeting on 15th September, the secretary of this branch intimated that a supply of forms had been received from the Sydney Public Library, by filling in which members could have from one to three books on science and art lent to them free of charge for one month.

Demonstration of the Use of Explosives.

In response to an invitation from the members of the branch, about thirty farmers and others attended to see explosives used for subsoiling purposes by

farmers. Following the directions given in various articles in the *Agricultural Gazette*, and by Mr. Coggins, Assistant Inspector, during his visit, a number of shots was fired off in a plot of young lucerne, the holes being 24 feet apart, and from 2 feet to 18 inches deep. In Mr. D. B. Weir's orchard, holes were drilled between several rows of trees, and plugs inserted at a depth of 2 feet, and fired with fuses. On clearing away the soil it was found that below the depth of the plugs there were cavities, and though the surrounding soil above the plugs did not seem to be materially cracked or pulverised, that below appeared to be loosened. In Mr. Taylor's adjoining paddocks several rows of holes were drilled about 10 feet apart, and plugs exploded. This land is to be planted with maize this season, and the crop on the treated area will come in for careful comparison with the rest, and in the same way the growth of the lucerne and the behaviour of the trees in the orchard will be closely watched.

Martin's Creek.

At a public meeting held on 2nd October, at the residence of Mr. E. Burt, Martin's Creek, it was decided to form a branch of the Agricultural Bureau. The following office-bearers were elected:—Chairman, Mr. A. Vogele; Vice-Chairman, Mr. E. Priestly; Hon. Treasurer, Mr. J. Robinson, sen.; Hon. Secretary, Mr. P. Laney.

Twenty-two members joined, and the secretary anticipates that this number will be considerably augmented at the next meeting.

Orangeville.

Mr. F. Wigan, Dairy Instructor, delivered a lecture to members of the Orangeville branch on the 9th September. The subject of the lecture was "The Cause of Inferior Cream, and how to improve the Standard of our Butters." The address was much appreciated by those present.

Orchard Hills.

The following was the result of the election of office-bearers for the ensuing year at the last meeting of this branch:—Chairman, Mr. C. Bloomfield; Vice-Chairmen, Messrs. R. Rankin and W. O. Hollier; Hon. Treasurer, Mr. E. Basedow; Hon. Secretary, Mr. H. Basedow.

Parkesbourne.

At a recent meeting of this branch the following interesting paper was read by Mr. W. H. Weatherstone:—

The Drainage of Orchard Land.

Drainage is positively necessary in some classes of soils, and beneficial in most; in fact, we are told that drainage is as necessary in some soils as cultivation and manures.

The soils that do not require drainage are those with non-retentive subsoils. The soils which most require drainage are stiff clay soils, swampy and peaty soils, or even light, sandy soils with stiff clay subsoils, especially when the clay subsoil is to be found at variable depths from the surface. A stiff clay subsoil is often to be found within a few inches of the surface, while at a comparatively short distance away the clay may be several feet below the surface. A clay subsoil having such an uneven surface would materially prevent the natural drainage of the soil, and in some cases force the surplus water up to the surface of the soil, or retain it in its pan-like formations and thus injure the roots of fruit trees or other vegetation. It seems to me that drainage would prove very beneficial to most, if not all, our orchards in this district, because (1) the clay subsoils are not of a uniform depth from the surface; (2) drainage, in addition to carrying off surplus water, admits air and light to the subsoil, and consequently has a wonderful physical effect on the soil; (3) orchards especially require drainage, because the trees are deep-rooting, and in undrained soils their roots may be standing in water, while their tops may be blistering in a semi-tropical sun. The hollows, or pan-like formations, in the uneven surface of the clay subsoil, retain an excessive

amount of water and cause what orchardists sometimes call "wet feet" or "root-rot," which means disease and death to fruit trees.

Orchardists sometimes attribute the unhealthy appearance of some of their trees to other causes, such as fungus diseases. I have seen in this district some excessively hard underlayers of a granite ironstone formation which come comparatively close to the surface, and no matter how wet the soil—one would require a good pick and a very strong arm indeed to make much of an impression on it. This kind of subsoil also prevents natural drainage, and under such conditions a healthy orchard is an impossibility, for if the trees are not killed right out they will be so injured that "gumming," "root-rot," and other diseases will make their appearance, and the trees will have but a lingering existence. Drainage also to some extent prevents surface washing, and tends to keep the land moist during droughts.

Various materials are used for drains and they are constructed in a variety of ways, such as with tiles, pipes, stones, and also wood, but the last-named should never be used where stone can be obtained. Rubble-stone makes an excellent drain if carefully put down. Dig the drain the required depth (2 to 3 feet), then fill in the bottom with about a foot of rubble stone, bring to an even surface, and cover with flat stones or wooden slabs, and then put in a layer of green boughs, or any suitable material to prevent loose earth from falling in among the stones and choking the drains when they are first filled in. Wooden drains, when properly constructed, will last for years. I have used saplings covered with a thick layer of boughs, and I find even this kind of drain will last a long time. But the better kinds of wood-drains are made by placing a slab of any good hardwood down on a ledge on each side of the drain, under which is left either a V-shaped or a square cavity as a channel; cover the slabs with boughs, &c., to keep the drain free from loose earth when first filled in.

Sackville.

The annual meeting of this branch was held on Friday, 10th October, when there was a fair attendance. The re-election of office-bearers took place, with the following results:—Chairman, Mr. C. Kaiser; Hon. Secretary and Treasurer, Mr. Arthur Manning.

An interesting discussion took place on the question of compulsory spraying for codlin moth.

St. John's Park.

A demonstration and lecture on "Explosives in Agriculture" was given by Mr. H. C. Coggins, Assistant Inspector of Agriculture, on Mr. J. D. Seccombe's farm, on the 5th September.

The attendance was very good, and great interest was taken in the proceedings, especially the subsoiling, which appealed to local farmers and orchardists, for, as Mr. Coggins stated, the subsoil in this district, being of a hard, impervious, clayey nature, acts as a water trap. Consequently the rainfall is confined to the top soil, thereby encouraging surface rooting, which is detrimental to the orchards in a dry spell.

Mr. Coggins also gave a demonstration in land-clearing, but stated that the timber in the district was too small to necessitate the use of explosives.

A hearty vote of thanks was accorded Mr. Coggins for the interesting and instructive afternoon.

Taralga.

At the monthly meeting, held on 15th September, general satisfaction was expressed by the members with the selection of areas by the Department of Agriculture for experiment plots in the district.

Toronto.

On the 9th September last Mr. R. G. Warry, Demonstrator in Apiculture, gave a lecture to members of the above branch.

The lecturer described briefly the growth of each description of bee, from the hatching of the egg to the time the bee emerges from the cell. The utility

of each particular bee to the colony was explained and illustrated in greater detail when speaking of the bee after it had emerged from the comb. Special reference was made to the importance of young bees as chyle-secreting bees. The possibilities of comb honey production for coastal bee-keepers were discussed, and a description was given of supers adapted to raising sections. The Golden Italian bee was recommended as the best breed for this purpose, as white capping is essential to first grade sections.

Uralla.

The membership of this branch now totals thirty-five.

Arrangements have been made for Mr. H. C. Coggins, Assistant Inspector of Agriculture, to conduct a demonstration of clearing and subsoiling with explosives, on Wednesday, 10th December. It will commence at 2 p.m., at Messrs. E. A. Neil and Buchanan Bros.' property, "Pomona," Uralla.

Walla Walla.

Mr. H. C. Stening, Inspector of Agriculture in the Southern District, gave a lecture on "Wheat-growing" to members of this branch on the 9th October. There was an excellent attendance, over fifty farmers being present. Mr. J. Wenke, President of the branch, occupied the chair.

Much time was devoted by the lecturer to the subjects of fallowing and wheat varieties. The reasons why fallowing should be practised, and the best methods of cultivation, were described, emphasis being placed upon the necessity for working the fallow during the summer months. The varieties of wheat most suitable to the district were enumerated, and remarks added on their seasons, habits of growth, and other characteristics. The lecturer strongly advised wheat-growers to grade and pickle their seed-wheat, and explained the necessity for applications of fertiliser, and for maintaining the supply of humus in the soil by rotating fodder crops with wheat.

The following are some of the questions put to Mr. Stening during and at the conclusion of the lecture:—

Question: Do you advise the ploughing in of stubble when it is not intended to fallow?

Answer: No. It is unfortunate that the ploughing in of stubble cannot be practised under all conditions, so that a portion of the plant food taken from the soil in the production of the crop may be returned. Straw decomposes very slowly, and unless the land is fallowed early the straw will not be sufficiently decayed by seeding time, and the soil will be too open, with the result that it dries out readily. Another serious objection to ploughing in straw or stubble land is that it is a hindrance to subsequent cultivation and a perfect nuisance when drilling.

Question: Which takes most from the land, a crop of hay or a crop of grain?

Answer: This depends upon how the stubble is disposed of after harvesting the grain crop. When the stubble is ploughed in after the grain crop, less plant-food is removed from the soil than by the hay crop. But the practice on most farms is to burn the stubble after the grain crop is harvested, in which case more valuable plant-food is removed from the soil by the grain crop than by the hay crop, for after the hay crop the soil receives the benefit of the ploughing in of the short stubble left after cutting with the binder.

Question: Is all the plant-food lost by burning the stubble?

Answer: The mineral elements, such as potash and phosphates, are retained in the ash of the burnt straw, but the more valuable organic matter and nitrogen are lost.

Question: Do you advise that fallowed land should be harrowed immediately after ploughing, or should it be left in the rough for some weeks?

Answer: When the land is fallowed early it is advisable that it should be left in the comb until early spring In this condition it is more receptive of the winter rains, is not so liable to set, and a greater surface of soil is exposed to weathering agencies. If, however, for any reason the ploughing is left until spring, the land should be harrowed immediately after ploughing

in order to check further evaporation, for the larger the surface of soil exposed the greater the evaporation, and evaporating influences are increased as the warm weather advances.

Question: When left in the comb, growth is frequently made between the sods?

Answer: Before ploughing, all growth should be fed down close, and the furrow-slice should be inverted sufficiently to bury the growth.

Question: Does bleaching affect the weight per bushel?

Answer: Yes, the weight per bushel is decreased.

Question: Does the ploughing in of natural growth provide humus as well as fodder crops?

Answer: Advantage should be taken to plough down all grass and rubbish, as it all contributes to the restoration of humus to the soil. But by the growing of fodder crops a greater bulk of fodder and a much larger quantity of organic matter is produced.

Question: What is your opinion of the growing of lucerne in rotation with wheat?

Answer: Where it is decided to spell a run-down wheatfield for a number of years, one cannot do better than lay it down with lucerne. Not only does it produce an abundance of the best of fodder for a number of years, but the soil is considerably benefited, for lucerne is a great soil renovator. Like all legumes it has the power, by means of bacteria on the roots, of utilising the nitrogen of the atmosphere and replenishing the soil with this valuable constituent.

Walli.

The land-clearing and subsoiling demonstration with explosives, given by Mr. H. C. Coggins, of the Department of Agriculture, on the 12th September, on Mr. Egerton's farm, was witnessed by a large number of farmers, many of whom came long distances.

Mr. Coggins operated on a green tree, selecting a large red gum, and explaining that it was only necessary to shatter the tree, and then start a fire under it in a couple of months' time, when it would be found that in its half-dry state it would burn well. The tree was shattered as desired by boring holes 3 feet under the tree and charging them with gelignite.

A vote of thanks was accorded Mr. Coggins for the demonstration and lecture.

Wollun.

A branch of the Bureau has been formed here, and a good membership is expected. The election of office-bearers resulted as follows:—Chairman, Mr. T. C. Burnell; Vice-Chairman, Mr. C. H. Benele; Hon. Secretary and Treasurer, Mr. C. E. Burke.

Wyong.

Mr. F. Wigan, Dairy Instructor, gave a lecture to members of the above branch on the 8th September. The subject was, "Second-grade butter: its Causes and Remedy." There was a fair attendance, and great interest was taken in the lecture. At the conclusion, a vote of thanks was extended to Mr. Wigan.

Explosives Demonstration.

A successful demonstration of the uses of explosives in agriculture was conducted by Mr. H. C. Coggins, Assistant Inspector, at Mr. Warner's property. A large blackbutt stump, 6 feet in diameter, was selected, and Mr. Coggins stated that in such a case it would be cheaper to shatter the stump than to bring it out bodily. It was accordingly dealt with on those lines, and left to be burnt out later, which could be accomplished without difficulty. Subsoiling work in the orchard was also illustrated and explained.

Orchard Notes.

W. J. ALLEN.

NOVEMBER.

Cultivation.

AT the risk of repeating the oft-reiterated advice, reference must again be made to the urgent necessity for the systematic use of the cultivator. The hot months of November and December are frequently the critical stages in the growth of the summer fruit crop, and the loss occasioned by neglect at this time can never be regained. Keeping the ground loose by constant cultivation, especially after every shower, and chipping the ground under every tree where it cannot be reached by the scuffle encourages a continuity of growth, both of foliage and fruit, which will show up handsomely in the final yields.

Thinning.

Sufficient attention is not given by orchardists to the desirability of judicious thinning. In many cases young peaches and apricots overtax their productive capacity, which may take a season or two to recover. Further, half a crop of well-formed fruit will yield a much higher net return than results from the sale of undersized poor quality produce. Even the most sceptical orchardist is advised to try the experiment on a few of his trees, and to take particular notice of the higher prices realised.

Harvesting and Grading.

Except in a few favoured districts where altitude and sheltered position enable the fruit to hang well on towards Christmas, the harvesting of oranges and lemons will be completed this month. Lemon growers especially are to be congratulated on the satisfactory prices realised.

Early apricots, cherries, and peaches will now be fit for market, and attention is directed to the necessity for grading the fruit and putting it up in the most attractive manner. The particular stage at which to pull should be chosen with keen discrimination, as it is easy to pick without allowing for the delay between the time it leaves the orchard and when it reaches the consumer. At the same time, handling the fruit before a certain stage can only result in loss, as it will never ripen. The best time can only be learned by experience.

Codlin Moth.

Spraying with arsenate of lead must be carried out in accordance with the provisions of the Act on the fifth day after the petals have fallen from the

flower, and second and third sprayings must be given within four and nine weeks respectively after the petals have fallen. The orchard should also be kept free of any rubbish likely to harbour the larvæ of the moth.

Summer Pruning and Disbudding.

A close inspection of the young trees will reveal many reasons for regulating their growth. Judicious thinning and shortening back will have two results—the tree will become evenly balanced and symmetrical, and the energy at present dissipated in crowded or superfluous growths will be directed into useful channels in forming a shapely tree.

Disbudding in both fruit trees and vines is oftentimes a most necessary operation, and should not be neglected, even in the present busy season.

Fruit Pests.

A sharp look-out should be kept for all pests, and timely attention in the early stages is well worth while. Red and other scales on the citrus trees, aphis on the peaches, woolly aphis on the apples, and many of the borers are ever active, and only by constant vigilance can they be kept in check. The vine moth grub (*Agarista glycine*) is again in evidence, and the vines are rapidly defoliated unless the pest is checked. Hand-picking in small vineyards, and the use of an arsenical spray in the larger ones, can be relied upon wherever the little shield bug is not present in sufficient numbers to effect a clearance.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1913.

Society.	Secretary.	Date.
Lismore A. and I. Society	T. M. Hewitt ...	Nov. 5, 6, 7
Tweed River Agricultural Society (Murwillumbah)...	A. E. Budd ...	,, 12, 13
Mullumbimby A. Society	W. A. Davis ...	,, 19, 20

1914.

Albion Park A., H., and I. Association	M. A. Brown ...	Jan. 14, 15
Gosford and Brisbane Water A. and H. Association	R. J. Baker ...	,, 23, 24
Kiama A. Association	G. A. Somerville...	,, 23, 24, 26
Wollongong, A., H., and I. Association	W. J. Cochrane ...	,, 29, 30, 31
Berry Agricultural Association	S. G. Banfield ...	Feb. 4, 5
Dorrigo A., H., and I. Society	W. R. Colwell ...	,, 10, 11
Moruya A. and P. Society	H. P. Jeffery ...	,, 11, 12
Alstonville Agricultural Society	C. D. McIntyre ...	,, 11, 12
Wyong A. Association	J. H. Kay ...	,, 12, 13, 14
Guyra P., A., and H. Society	P. N. Stevenson...	,, 17, 18, 19
Gunning P., H., and I. Society...	J. R. Turner ...	,, 18, 19

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1914.

Society.	Secretary.	Date.
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Dapto A. and H. Society	J. H. Lindsay ..	,, 24, 25
Manning River A. and H. Association	S. Whitbread ...	,, 25, 26
Inverell P. and A. Association	J. McIlveen ...	,, 25, 26, 27
Bowraville A. Association	C. S. Cliff ...	,, 26, 27
Uralla A. Association	H. W. Vincent ...	Mar. 3, 4, 5
Tenterfield P., A., and M. Society	F. W. Hoskin ...	,, 3, 4, 5
Tumut A. and P. Association	T. E. Wilkinson...	,, 4, 5
Braidwood P., A., and H. Association	L. Chapman ...	,, 4, 5
Oberon A., H., and P. Association	M. J. Looby ...	,, 5, 6
Central New England P. & A. Association (Glen Innes)	George A. Priest...	,, 10, 11, 12
Molong P. and A. Association	W. J. Windred ...	,, 11
Coramba District P., A., and H. Society	H. E. Hindmarsh ...	,, 11, 12
Bombala Exhibition Society	W. G. Tweedie ...	,, 11, 12
Campbelltown A. Society	F. Sheather ...	,, 11, 12
Tumbarumba and Upper Murray P. and A. Society...	E. W. Figures ...	,, 11, 12, 13
Wauchope P. A. and H. Society	A. D. Suters ...	,, 12, 13
Gundagai P. and A. Society	A. Elworthy ...	,, 17, 18
Bangalow A. and I. Society	W. H. Reading ...	,, 17, 18, 19
Armidale and New England P., A., and H. Assoc'n.	A. McArthur ...	,, 17, 18, 19, 20
Cumnock P., A., and H. Association	K. J. Abernethy...	,, 18
Cobargo A., P., and H. Society	T. Kennelly ...	,, 18, 19
Camden A., H., and I. Society	C. A. Thompson...	,, 18, 19, 20
Goulburn A., P., and H. Society	G. G. Harris ..	,, 19, 20, 21
Mudgee A., P., H., and I. Association	P. J. Griffin ...	,, 24, 25, 26
Narrabri P., A., and H. Society	D. J. Bridge ...	,, 24, 25, 26
Blayney A. and P. Association...	H. R. Woolley ...	,, 25, 26
Macleay A., H., and I. Association	E. Weeks... ...	,, 25, 26, 27
Crookwell A., H., and P. Society	H. P. Levy ...	,, 26, 27
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Adaminaby P. and A. Association	W. Delany ...	,, 15, 16
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Kyogle P., A., and H. Society	R. J. Nithery ...	,, 22, 23
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Northern Agricultural Association (Singleton) ...	E. J. Dann ...	,, 29, 30, May 1
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Hawkesbury District A. Association (Windsor) ...	H. S. Johnston ..	,, 7, 8, 9
Lower Clarence A. Society (Maclean)	J. McPherson ...	,, 12, 13
Murrumbidgee P. and A. Association (Wagga Wagga)	A. F. D. White ...	Aug. 25, 26, 2

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam	Stationed at—	Engaged up till—
Shorthorn ..	Pansy's Progress	Dora's Boy ...	Pansy 4th (im.)	Wollongbar Farm	*
,, ...	Imperialist ...	Florio	Lady Nancy of Minembah.	,, ,,	*
,, ..	March Pansy ...	Earl March ..	Australian Pansy	Grafton Farm ...	*
Jersey .	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
,, ..	Thessalian II. ..	Thessalian (imp.).	Egyptian Princess (imp.).	,, ,,	*
,, ...	Elaine's Heir ...	Thessalian II ...	Wagga Elaine	Yanco Farm ...	*
,, ...	Royal Blood ...	Berry Melbourne	Calceolus ...	Wollongbar Farm	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie ...	Berry Farm ...	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Wagga Farm ...	*
Guernsey ..	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Kyogle	30 June, '14.
,, ..	Star Prince ...	Calm Prince ...	Vivid (imp.)...	,, ...	5 Mar., '14.
,, ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Maclean	11 Jan., '14.
,, ..	Prince Souvia ...	Vivid's Prince...	Souvenir(imp.)	Grafton ...	*
,, ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Wollongbar Farm	*
,, ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 April, '14.
,, ...	Sunshine ...	King of the Roses	Princess Vivid	Grafton	15 Jan., '14.
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	Claudius (imp.)	Golden Star II..	Claudia's Pride(imp.).	Tweed River ...	18 Feb., '14
,, ...	Trengwainton VillageFavourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Jones Island ...	31 Dec., '13.
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (im.)	Bega	20 Dec., '13.
,, ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Kyogle	3 Mar., '14.
,, ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel(imp.).	Murwillumbah ...	9 May, '14.
,, ..	Prince of Warren Wood (imp.).	Kingsmoor Governor (1952)	Quail (7051)	Macleay River ...	8 Dec., '13.
,, ..	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Frederickton ...	20 Mar., '14.
,, ...	Rosehill (imp.)..	Northesk (2073)	Faultless Footsteps (6132)	Raymond Terrace	19 Dec., '13.
,, ...	Duke of Orleans	Godolphin Arthur (1664)	Flower of the Preel 3rd (imp.)	H.A. College, Richmond	*
Ayrshire ..	Jamie's Heir ..	Jamie of Oakbank	Miss Prim ...	Wollongbar Farm	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose..	Grafton Farm ...	*
,, ...	Orphan Boy ..	Songster of Greystanes.	Rosamond ...	Glen Innes Farm..	*
,, ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A.College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ..	Aicme Chin(imp.	Bratha 4th	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ..	Bathurst Farm ...	*

*Available for service only at the Farm where stationed. † Available for lease or for service at the Farm where stationed.

Department of Agriculture,
Sydney, 3rd November, 1913.

BULLS FOR SALE

AT BERRY EXPERIMENT FARM.

GUERNSEYS.—Lassie's Favourite: sire, Trengwainton Village Favourite (imp); dam, Rohais Lassie 2nd; calved 14th June, 1912. Price, **£30.**

Rohais Lassie (imp.), dam of Rohais Lassie 2nd, gave 33 lb. butter in 42 weeks.

The Saint: sire, Trengwainton Village Favourite (imp.); dam, Angel Vivid; calved 8th July, 1912. Price, **£30.**

Angel Vivid gave 318 lb. butter in 36 weeks.

Four-leaf Shamrock: sire, Calm Prince; dam, Shamrock of Les Vesquesses (imp.); calved 26th November, 1912. Price, **£30.**

The dam of this bull gave 285 lb. butter in 41 weeks.

King of the Preel: sire, Trengwainton Village Favourite (imp.); dam, Flower of the Preel 3rd (imp.); calved 31st December, 1912. Price, **£30.**

The dam of this bull gave 332 lb. butter in 40 weeks.

AT COWRA EXPERIMENT FARM.

JERSEY.—Shakespeare: sire, Sir Pat; dam, Leading Lady; calved 13th January, 1912; colour, whole fawn. Price, **20 guineas.**

Leading Lady is by Berry Melbourne from Lady Tidy 4th.
Lady Tidy 4th was by Golden Lord from Lady Tidy 3rd (imp.).
Berry Melbourne is by Melbourne (imp.) from Rum Omelette (imp.).
Sir Pat is by Sir Jack from Pattibelle (192)
Leading Lady, on her first calf, yielded 3,346 lb. of milk, testing 6 per cent., equal to 237 lb. of butter.

HOLSTEIN COWS FOR SALE.

BERRY EXPERIMENT FARM.

Name.	Date of Birth.	Sire.	Dam.	Price.
				£
Lolkje Field (in calf)	12 Nov., 1904 ...	Garfield	Lolkje	20
Fraulein Arama (in calf) ..	4 Feb., 1907 ...	The Hague ...	Dina's Douwe ..	25
Marigold (in calf) ...	25 Feb., 1907 ...	The Hague .	Margosa	25

GUERNSEY BULLS FOR LEASE.

Guernsey Bulls will be available for lease in December for Six or Twelve months in the following districts:—

Manning River.
Bega.
Macleay River.
Raymond Terrace.

Early application is necessary.

GEORGE VALDER, Acting Under-Secretary.

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Agricultural Gazette of New South Wales.

Dairy-farming on the Yanco Irrigation Area.

M. A. O'CALLAGHAN.

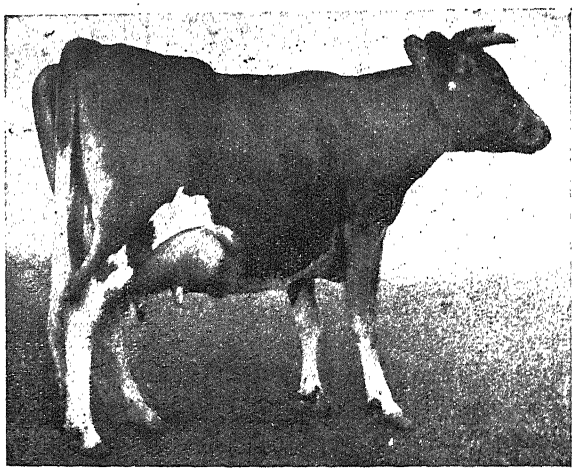
Future of Dairying.

OWING to the amount of attention that has lately been drawn to the manufacture and sale of margarine, many people have questioned the writer regarding the future of dairying, and how far margarine is likely to affect the prospects of the industry. After a very careful survey of the whole question, as afforded by statistics representing the world's production and consumption, the conclusion has been forced on me that margarine has been called on to a greater extent of recent years owing to the fact that the world's butter supply was somewhat deficient, and some other form of edible fat had to be found to meet the wants of a growing population. The increase which has taken place in that section of the world's population which can afford to eat butter has had a marked effect on the demand for butter, and consequently the price has been affected thereby. As butter got dearer, so the necessity arose for something to supply its place at a lower rate. Butter of an inferior quality was even at a price beyond the means of a great number of people who must have, in the winter months at least, some kind of edible fat, and consequently the margarine manufacturers had a special opportunity, of which they have taken full advantage. After all, if the dairy-farmers do not supply sufficient butter to meet the world's demand, they can scarcely object to that food supply being made available from some other source, providing there is no misrepresentation. The quality of margarine has so improved that butter-makers will be compelled to pay more attention to the quality of the article produced, or they will bring about their own ruin. Margarine does not invade the field open for the consumption of high-class butter, and hence makers of high-class butter have nothing to fear from margarine competition.

Brighter Prospects for Australian Trade.

Owing to the fact that America is not able to supply itself with butter and cheese, a strong demand is being made on Canadian farmers by American consumers, and consequently less cheese is being exported to England from Canada, and no butter. This leaves an opening for the New Zealand cheesemaker to supply the deficiency in Canadian exports to England, and as the New Zealander manufactures more cheese to meet requirements, he will have less butter to ship to England. Consequently Australia will be called on to supply more, especially during those months of the year when European supply is the smallest. In addition to this, the American markets

are, for the first time, being thrown open to butter from other countries, as the duty on imported butter has hitherto been at a prohibitive rate. Owing to a change in policy, as well as to the fact that the United States wants more butter than it can produce, the duty on butter has been reduced from 6 cents to 2½ cents per lb., and at the present time an active inquiry is being made by American merchants regarding the possibility of imports from Australia. This gives the southern continent another string to her butter bow, and consequently places the Australian dairy-farmer in a much better position than previously. Not only have we got the English market, but there is a large and growing market in the East, and to this we now add the great demand for Australian butter, which promises to come from the United States. This should more than minimise any possible effects margarine manufacture may have, provided we keep up the quality.



Guernsey Cow, Bel Air VI (imp.).
Bel Air VI (imp.) is the dam of one of the Guernsey Bulls (viz., King of the Air) leased by the Commissioner to Yanco dairy farmers.

Possible Development in Cheesemaking.

Owing to the great increases in the population of the United States of America, and also to the rapidly-increasing population of Canada, the demand made for Canadian-produced cheese by the American people is growing daily; and as a consequence it is anticipated that there will be a big deficit in Canadian cheese exports to England as soon as the altered United States tariff comes into force. So much is this being felt that there is a very strong inquiry for cheese from English merchants, and the prices in England are so good that we shall probably develop an export trade in cheese from New South Wales from now on. This will help to keep the price of cheese in our own State up to a very good paying standard, and at the same time will afford good opportunities for those who have suitable conditions to develop cheese-making to a greater extent. This will also help to

balance the butter market, and prevent any material depreciation in prices for years to come.

Improved Bacon Values.

Owing to a world shortage in bacon, the price of this article of food has increased very materially of late. This is an important factor in the economics of dairy-farming, because on the price of pigs depends, to a very great extent, the value of the farmers' separated milk. At the present price of bacon, separated milk is worth at least 2d. per gallon for pig-feeding, and thus it is that the revenue from the dairy-farm is increased considerably. Supposing the separated milk yield from a cow is put down at 450 gallons. For pig-feeding, at present values, this would be worth at least £3 15s.; add this to, say, the minimum butter value of a cow of this standard, and we get £13 2s. 6d. as the total value of the cow's milk, provided butter is worth on the average 10d. a lb. net. These values are on a very much better standard than they were ten years ago, and consequently we look to a very considerable further development in Australian dairying.

It will certainly pay the man who is farming at Yanco very much better to sell only butter and pork off his farm, thereby doing the least possible to impoverish his land. The dairy-farmer who studies his business will retain the fertility in his lands when other classes of farmers, who sell large quantities of fodder crops off their farms will, unless they expend large amounts in manures, have greatly deteriorated the productive capacity of the soil.

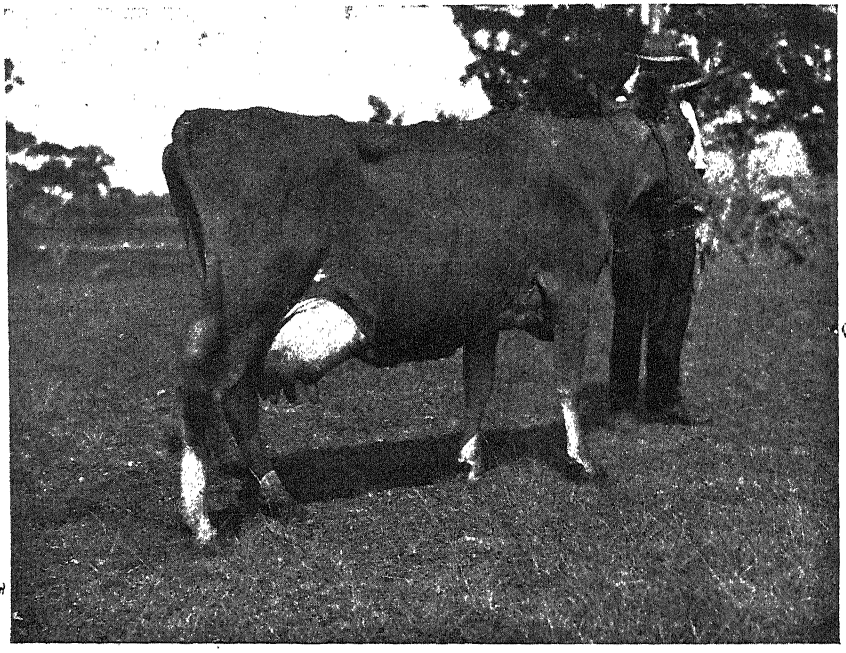
Dairy Farming on the Murrumbidgee Irrigation Areas.

About a year ago I wrote an article dealing with Yanco as a dairying proposition. This was published in the *Agricultural Gazette,* and attracted considerable attention; consequently I have been appealed to a great deal for advice with regard to taking up land at Yanco. At the time of writing that article, my opinions were based on a general inspection of the irrigated land, and of the fodder crops that were growing thereon, as well as on the information afforded by observations on dairying as carried on at the Government Experiment Farm at Yanco. It had been shown at this farm that Jerseys which had been transferred from Wagga Experiment Farm not only thrived under the new conditions, but put up such high butter records, that the suitability of Yanco for butter production under irrigable conditions claimed close attention. I have already stated that cattle purchased on the coast and transferred to Yanco, no matter whether they were Jerseys, Guernseys, Ayrshires, or Shorthorns, all did well, and those that were acclimatised before being brought in to dairying at Yanco have done best, as they came into milk in high-class condition.

Milk and Butter Records.

It is to the credit of the Yanco district and Yanco Experiment Farm that probably the largest butter record ever put up in Australia by a young Jersey on her first calf has been produced there, through the medium of the cow "Yellow Aster," by Golden Lord, from Aster. Her record for lactation

period was 5,911 lb. of milk, testing equal to a production of 410 lb. of butter, Another cow, on her first calf (by the same sire), viz., "Golden Gauntlet," produced 5,686 lb. of milk, testing equal to 354 lb. of butter; while a third Jersey, on her first calf, viz., "Rosetta," produced 4,447 lb. of milk, testing equal to 314 lb. of butter. These records put up by heifers on their first calf, without being pampered in any way, afford considerable food for thought, and no matter how we view the position, every dairy-farmer of experience must realise the possibilities of a country where such records are produced.



Guernsey Cow, Calm II.

Sire: Rose Prince (imp.); Dam: Gentle (imp.). Calm II is full sister to the sire of King of the Air.

A Demonstration Dairy Farm.

When at Yanco last summer I became deeply interested in the possibilities of the irrigation area, and observations enabled me to see that there were quite a large number of settlers who had taken up land, and who had no fixed idea as to what class of farming they would carry on. Some spoke of dairying, others of lucerne-growing; while others spoke of fruit culture. Generally speaking, the fruitgrower had his mind made up, but the other type had not, and as there was an evident want of some person to take a leading and a guiding hand with reference to dairying, I suggested to the Commissioner that if granted exemption of residence I would take up land there, and demonstrate through a working partner the correct way in which dairying should be conducted on the area, and at the same time show what

the financial aspect was. The Commissioner and the Minister of Agriculture agreed to this, and consequently I am now in a position to speak with some experience on the local aspect of the question. The land taken up was part of the old lucerne area used by Sir Samuel McCaughey, and although this had some disadvantages, it had the great advantage of placing me in a position to make an early start, and see what dairy cows could do right away, without having to wait for twelve months to get the land under crop and provide fodder during the summer months. It may be of interest to state here that the lucerne referred to had been planted about eight years, and was, where watered, in a good healthy condition.

A herd of about forty heifers was procured, and during the winter months I grazed those which had calved on the adjoining non-irrigable land and sent the cream produced to the local butter factory.

Records of a General Herd.

One swallow does not make a summer, and the records of the three cows given above might by some be considered as very special exceptions, and hence the practical man will no doubt look for something very comprehensive. The settlers at Yanco formed a Herd-testing Association a few months ago, and the herd referred to has been tested at least once a month since.

Records for September.

The tests made of my herd in September show that the twenty-five cows, all of which save one, which was going dry, were on their first calf, averaged 1·27 lb. of butter per day. Some of the cows have been in milk about four months, while others have only recently calved. Supposing that all the milk had been separated (reserving none for calf-feeding purposes), and the cream from same sent to the factory for a thirty-day month, the cows would have averaged 33s. 5d. each, butter being estimated at 10½d. per lb. These figures tell their own tale to the experienced dairyman, and when it is stated that half these heifers were purchased at £6 10s. per head, it will be understood that I have not gone about the country selecting individual champions for the purpose of establishing records. Most of the cows are either pure Jerseys, or Jerseys of high grade. Some were bred by Mr. Thompson, of St. Marys, and the others on the South Coast and Hunter River.

Records for October.

The test made during the month of October proved better than that for September. The actual butter production represented by the test was 1·4 lb. of butter per day. Calculated at 10d. per lb. for butter, this worked out at 35s. per cow per month, the number of cows in the herd at the time being twenty-nine. Each of these is on her first calf. The best yield was 2½ lb. of butter for the day, and this was put up by a grade Jersey. A Shorthorn heifer gave 2 lb. of butter per day, and a Guernsey heifer gave 1·7 lb. In fact, the whole records are so interesting that they are given herewith.

Many of the heifers were 2½ years old when they gave birth to their first calf.

Cow's Name	Total Milk in lb. for day.	Butter Fat per cent.	Butter per day.
			lb.
Brindle	24	5·2	1·46
Queen	28	4·1	1·35
Velvet	17	5·0	1·00
Mona	23	4·7	1·26
Alma	21	4·1	1·01
Cockle	20	6·0	1·42
Molly Bawn	22½	4·6	1·21
Peggy	18	5·0	1·06
Miss White	21	4·7	1·15
Miss Berry	21	4·5	1·11
Rose	22	6·6	1·72
Mabel	13	6·7	1·02
Wild Eye	24	4·5	1·27
Pig	25	5·6	1·65
Bud	26	5·2	1·59
Primrose	25	4·9	1·44
Waterville Maid	33	4·4	1·70
Crocus	35	3·9	1·60
Turtle	22	5·1	1·32
Sweet Nell	12	5·2	0·73
Myrtle	32	6·6	2·50
Tulip	32	5·4	2·04
Medge	32	4·8	1·81
Blossom	27	5·2	1·65
Bessy	34	4·6	1·84
Daisy	21	4·8	1·18
Pansy	25	4·2	1·23
Midget	30	5·4	1·91
Dora	29	4·8	1·64

Food Used.

Milk and butter records of any kind are not of much use to the practical dairy-farmer unless he knows the cost of feeding the cows, or, in other words, what it costs to produce each pound of butter; hence it is necessary to state the class of food supplied to cows whenever records are mentioned. At the time the September test was carried out, and for some time previous, these cows were depastured on the natural herbage and grasses common to the non-irrigable lands on the irrigation area. The increased yield in October may be attributed to the fact that the heifers which calved last turned out to be particularly good ones, and also to the fact that the entire herd had access, in addition to the pasture on the non-irrigable land referred to, to a paddock in which there was lucerne as well as grasses growing.

This brings us to a consideration of the economic side of the question, and in discussing this we must give due consideration to the

Value of the Non-irrigable Section for Dairying.

When writing on the subject about a year ago, it was not possible to estimate with any degree of accuracy the value of the non-irrigable lands to the dairy-farmer. I am now in a position to say, however, that providing the non-irrigable lands are attached to and therefore form a part of the

dairy-farm, they will, in the ordinary year, provide sufficient grass for cattle for about five months. Some farmers who have taken up irrigation blocks have made their selections some distance from the nearest possible non-irrigable lands, and as a consequence are not in a position to make any material use of these non-irrigable lands except for dry stock, and the value of any section of land as a dry run for a dairy-farmer is a low one; probably less than these lands are valued at. Needless to say, the men who are placed in the position referred to are men who had no experience of dairy-farming, but who have decided to go in for dairying to some extent owing to the evident suitability of the district. To those intending settlers who have any idea of carrying on dairy-farming either wholly or merely as a secondary industry to lucerne-growing and the sale of lucerne hay, I would say, make sure that the farm or irrigable block which you select is either adjoining non-irrigable lands or is very close thereto. As a matter of fact, the first subdivision does not appear to have been made with a view to making the fullest use of the non-irrigable lands for dairy-farming, but in future subdivisions it is, I understand, intended to cater for this point in a proper manner, and have certain farms allotted as suitable for dairying, with irrigable and non-irrigable lands in close proximity, to complete the farm.

Valuation and Rentals of Irrigable and Non-irrigable Lands.

So much has appeared in the Press regarding the valuation of these lands, that it is difficult for the man who is not in a position to know what has been done to realise exactly the rental values as compared with the capital values of the land. Let us take an example. My own block, Farm 315, area 53 acres 1 rood, is valued at £1,051 13s. 9d. The whole of this block is classed as irrigable. The valuation works out at £19 15s. per acre. On this, rental is calculated at the rate of 2½ per cent., which comes to £26 5s. 10d. Now, the actual estimate of the valuation of that land was exactly half the amount named; and undoubtedly, if the land were being put on the market as freehold, it should be charged for at only half its gazetted capital value for rental purposes, for the simple reason that the Crown is, through an Act of Parliament, only able to collect at the rate of 2½ per cent. interest on leased lands, but as the money for purchase and construction work was borrowed, I understand, at about 4 per cent., it has been found necessary, in order to meet the interest at which the money was borrowed, as well as to cover other expenses, to charge 5 per cent. on the original valuation of the land to the settler, but instead of charging the 5 per cent. on the original value of the land, the value has been doubled and the interest rate halved. As far as leasehold is concerned, it makes no difference to the farmer whether the interest is halved and the capital value doubled, or the interest doubled and the capital value left at its original standard. The position should, however, be made quite clear, so that if any future Government in years to come decides to allow settlers to purchase freeholds the valuation and actuarial position should be clearly shown.

Cost of Water.

The rental given here, needless to say, does not include the water-rate. This is fixed at the rate of 5s. per acre foot, but not until the sixth year of occupancy is the full water-rate chargeable. For the first year only 2s. 6d., or half the rate, is charged, for the second year three-fifths of the full rate is charged, for the third year seven-tenths, for the fourth year four-fifths, for the fifth year nine-tenths, and for the sixth and following years the full rate, viz., 5s. per acre. This means that after five years for the irrigable land taken up I shall be paying, practically speaking, 15s. per acre total rent. As showing that there is a considerable variation in values, take, say, Farm 201. There are in this, 60 acres, all of which are irrigable, and the valuation of which is £870. This works out at £14 10s. an acre, or before the capital valuation was doubled for estimating interest, £7 5s. There are other lands valued still lower, but they are not classed as having the



Lily of Darbalara.
A first-class Shorthorn Cow. Shorthorns are doing well at Yanco, one in the herd having tested equal to 2 lb. butter per day on her first calf.

same carrying capacity, though from a dairying point of view the carrying capacity will depend greatly on whether the non-irrigable land is adjoining or not, and, therefore, the absolute necessity both from the point of view of the irrigable as well as the non-irrigable lands for all lands specially suited for dairy-farming to be subdivided so that there shall be a section of irrigable and non-irrigable land on each farm.

Description and Value of Non-irrigable Lands.

Generally speaking, I understand the non-irrigable lands so far classified have been valued so that the rental works out at 4s. per acre per annum. This is more than the rental value of these lands for pastoral purposes, but of course the value of the non-irrigable lands is enhanced because of their being adjacent to irrigable lands on which fodder can be provided, and therefore the risk of suffering heavily through drought prevented. As

stated elsewhere, the summer in the Yanco district is, like almost all inland districts of New South Wales, a hot one, and Nature in her great wisdom rests during that portion of the year which the climate makes it severest for the reproduction of the plant species. In cold latitudes Nature rests in winter time, but this is the period of the year when the most exuberant growth is found on the lands of the Murrumbidgee areas.

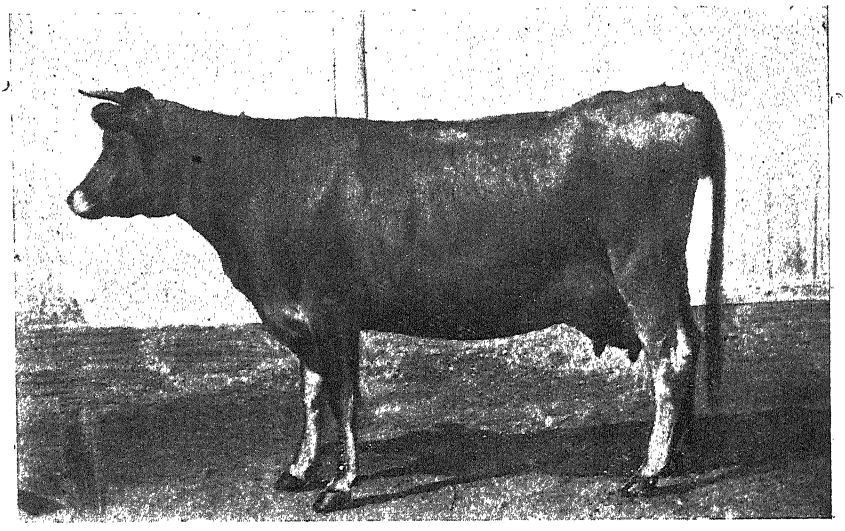
Growth of Herbage.

The plant commonly known as "crowfoot" during autumn and winter months forms the main portion of the pasturage. It grows with great rapidity, and in a short time attains to about the same height as mature lucerne if not fed down. If fully stocked, however, the plant partakes more of a dwarf growth, and is greatly relished by stock of all kinds. From observations made, crowfoot appears to have a great many of the characteristics of lucerne. It will only grow on sweet soil, and here and there one sees patches where there is not a trace of crowfoot. Barley grass is also very common throughout the area, although if allowed to seed it becomes to some extent a nuisance, because the seeds penetrate the animals' skins and sometimes form small tumours. It is, however, an excellent fodder when young, and by keeping it closely stocked the seeding does not take place to any extent. Trefoil is another plant that grows in great luxuriance, especially during the early spring months. All of these disappear with the heat of summer, and then wherever water is available native summer grasses spring up. It is sufficient to say that the cows whose records are already given were pastured on a paddock on which crowfoot was the main herbage in order to demonstrate the value of that plant for milk and butter production. Owing to the great quantity of seed both of crowfoot and trefoil that remains on the ground after the spring months, cattle and sheep maintain their condition remarkably well through the summer on paddocks which to the coastal dairy-farmer would appear to be practically bare of grass.

Forage Crops and Grasses Suitable for Irrigable Lands.

As lucerne is the best forage plant known to man at the present time which suits our Australian conditions, so the soil which is highly suitable for the growing of lucerne is more valuable from the point of view of producing fodder crops than is any other class of land on the Murrumbidgee irrigation area; having proved itself particularly suitable to the growth of lucerne the land has become valuable accordingly. There are certain conditions, however, which are necessary in order to make lucerne-growing a highly profitable occupation, and one of these is that a farmer must be in a position to market the product at an expense which will not be too high a proportion of the actual sale value of the crop. Lucerne-growers in the Tamworth district estimate that it does not pay them, one year with another, to sell lucerne when it falls below £3 per ton, free on rail, at the nearest station. In other words, after they have paid for the labour of

cutting and pressing, and after they have made provision for a fair interest on the capital value of the land, there will not be sufficient profit left on the forage to allow a reasonable profit to the grower unless an average price of £3 per ton free on rail can be obtained. The truck rates for 6 tons of lucerne from Tamworth to Sydney work out at £3 0s. 6d., and from Yanco to Sydney at £3 9s., or 10s. 1d. per ton from Tamworth



Hinemoa of Wagga.

Two year old Jersey Heifer by Kaid of Khartoum. Kaid of Khartoum has been stationed at Yanco Experiment Farm. He is proving a worthy descendent of Sir Jock.

and 11s. 6d. per ton from Yanco. Yanco is 367 miles by rail from Sydney, whereas Tamworth is only 282 miles. With the advent on the market of all the lucerne that is likely to be grown at Yanco in the ordinary year, the price for lucerne hay would drop very considerably, and it would only be in years of scarcity that the Yanco farmers would be able to obtain £3 per ton free on rail. Hence the great value of an industry like dairying, whereby the crops produced in bulk from the soil are sent to market in a concentrated form, such as butter, through the agency of the cow. Not only does the cow consume the main portion of the lucerne sent to Sydney, but by the agency of the cow in a district like Yanco the market price of lucerne hay can be maintained on a paying basis, for when lucerne values fall below £3 free on rail per ton, it should pay Yanco dairy-farmers better to feed it to dairy cows than to send it to Sydney for sale.

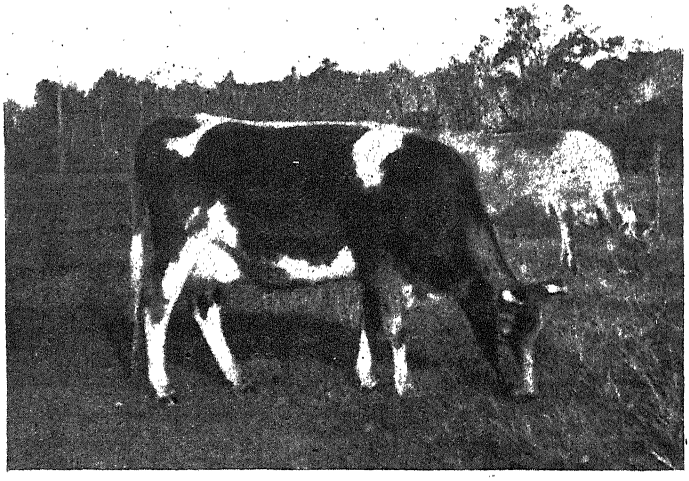
Other crops suitable for dairying that have grown well on the area are sorghum, green oats, green barley and green wheat, also maize for ensilage purposes or for a fodder crop. On lucerne land, however, none of these latter will be grown to any material extent, because lucerne supplies practically all that is required in the way of forage crop.

Lucerne for dairying purposes involves an economic problem which will be discussed briefly: When lucerne is growing quickly as it does under irrigation, it is not possible to depasture dairy cows thereon without running a considerable risk of losing a certain percentage of animals through what is known as *blowing* or *hoven*. It is also not advisable to allow cattle on to lucerne grown soon after irrigating it, so that taking it as a whole the grazing of dairy cattle on lucerne is not a sound proposition. It would pay better to cut the lucerne and allow it to dry for a day or two, and then give it to the cattle, but this involves an additional expenditure, and unless a farmer has a considerable amount of labour available in his own family he may find that the expense would be too great for the return obtained. It is true that at Yanco he would probably be faced with this proposition for about only six months in the year, because during the other six months the non-irrigable land will provide him with suitable herbage and pasture. It is considered, however, that by a judicious mixture of grass with lucerne the cows can be grazed thereon for a part of the year without any appreciable risk of death through hoven, and also without materially injuring the land in the way of trampling it a few days after it has been irrigated. It has been demonstrated both on irrigation areas and elsewhere that prairie grass combines excellently with lucerne to make a pasture for cattle, more especially during the late autumn, winter, and spring months when prairie grass grows most abundantly. Then when the warmer weather sets in lucerne grows rapidly and prairie grass disappears to a great extent. At this stage there is an extra risk of hoven, and hence it is advisable to have in the pasture some grass which will not kill out lucerne, and which will grow during the summer months when prairie has ceased to make much headway. In some climates perennial rye grass would fill this requirement, and I am hopeful that under irrigation it will do so at Yanco, though, of course, the climate under ordinary conditions would not be at all suited to rye grass. If by a mixture of prairie, lucerne, and rye grass it can be shown that cows can be depastured throughout the summer months on the irrigable areas at Yanco, then the economic problem will not only have been solved, but a very much higher value will be given to the lands suitable for dairying. The two grasses mentioned will form a sufficiently good sole of pasture to prevent cattle walking on it from making deep impressions in the soil, and the lucerne will not only go towards supplying an extremely valuable milk-producing fodder, but it will tend to renew the fertility of the soil, owing to its capacity to take nitrogen from the air and transfer it to the soil. Clover, rye grass, and prairie grass, apart from lucerne, should form a valuable pasture.

Nature's Teaching and Natural Advantages.

Nature demands that every animal and every plant that reproduces its species must have an annual rest if the species is not to suffer. This is the reason why lands and pastures that are constantly being overstocked and do not get an opportunity to regenerate gradually become inferior and less

productive. Richmond River farmers have had an example in recent years of how even that very prolific plant *paspalum dilatatum* has shown a tendency to lengthen its period of rest according to the number of years that it has been kept without renewal. This, of course, applies chiefly in those cases where farms are kept so well stocked that the plant not only does not seed, but gets no opportunity to decay and store up some invigorating material in its roots for future growth. Unfortunately even when paspalum does get an opportunity to seed at the present time on the Richmond



Guernsey Cow, Morden Lady III.
By Merton Signet (imp.) from Morden Lady (imp.), dam of Stud Bull used on Dairy Demonstration Farm.

River, the land is so thickly matted with the grass that the seed cannot reach the earth and grow, consequently the old roots have to keep supplying the fresh leaves year after year; and even with the lucerne plant which declines to grow during the winter, and thus obtains an annual rest, renewal must be carried out after a certain number of years, or the crop becomes unprofitable. Just the same as the root of a tree can only support the plant for a limited number of years, so the root of the grass will only continue to produce normal results for a limited period of time, and it is not against the productiveness of the plant that it ceases to be as productive when it is twelve years old as when it is one or two. Every plant and every animal deteriorates with old age.

Now the conditions of dairy-farming at Yanco are such that Nature can and will rest annually, and not only will the plant be thus placed in a condition to continue the renewal of its species without degeneration, but the soil will also be able to provide the necessary soluble plant food to continue maintaining the plant species in a proper manner.

On the non-irrigable lands the natural grasses and herbage take a good annual rest, most of the plants resting during the summer, while in the winter months the perennial plants, such as lucerne, on the irrigated area will rest; and all this takes place without interfering with the productive capacity of the cows that are used for dairying there.

Carrying Capacity and Productivity of the Land.

Given 50 acres each of irrigable land and of non-irrigable, or, as it is termed, dry land, a dairy-farmer should be able to run a herd of fifty cows if he so desired, and at the same time store a little lucerne hay for purposes of sale or for putting by in case of the early autumn and winter rains being missed, which, of course, would rob the farmer of the herbage and grasses during the winter and spring on the non-irrigable lands.

The rent of the land sufficient to carry a cow could then be put down at, say, 15s. for irrigable land, including water, and 4s. for non-irrigable land, or a total of 19s. It remains for dairymen in the various districts of Australia to work out for themselves what the cost of carrying a cow is where they are at present farming, and then will arise for them the query of "Will it pay those who send some of their sons to take up land in other districts—to send them to Yanco with a view to taking part in dairying, or dairying and lucerne-growing as a combination?" Lucerne-growing alone, it should be remembered, requires a good deal of capital if the farmer is to be in a position to hold his product until a satisfactory price is always obtainable, whereas if he combines dairying with lucerne-growing the cow will bring him in a regular monthly return, and, to use a common expression, will keep the pot boiling while the lucerne hay is increasing in value.

Productive Capacity of the Soil and Herbage.

So much for the carrying capacity. We will now discuss the productive capacity of the soil and herbage from a dairying point of view.

The returns given for the herd of young cows referred to sufficiently indicate what the natural herbage is able to do, given suitable cattle, during the spring and winter months, and there are small herds of mature cows on the area that are doing somewhat better, but a feature of cattle records on this area which has attracted my attention during the last twelve or eighteen months has been the very high butter-fat tests shown by the cows there. Not only have Jersey cattle tested higher than the average, but cattle of other breeds have also tested higher than we are accustomed to experience, on the coastal districts of Australia, at any rate. We must then ask ourselves, "Is this just a chance example of extremely rich milk in the case of a few individual cattle, or is there some cause to which we can scientifically attribute an increased richness of the milk produced?" Recent experiments carried out in England have proved that dairy cows yield richer milk when they are drawing on their body fat for the necessary wherewithal to produce butter-fat than when the animals are drawing their butter-fat supply direct, or even partly so, from the food consumed a short

time previous. Though there was not actual proof of this until recently, the result is in keeping with the old-established beliefs of dairy-farmers who have been the descendants of dairy-farmers for centuries, and whose experiences have been so wide and so continual as to make their observations worthy of being given considerable reliability. Every dairy-farmer of experience believes that when dairy cows calve while in low condition their



One of the cows on the Demonstration Dairy Farm.

milk will not be of as good a quality as if they had come to the dairy in good condition. This is practically the case that has now been proved, and it is only common-sense to believe that the cow is in a better position to supply butter-fat in a high degree if she has in her system a reserve on which she can draw without living, so to speak, from *hand to mouth,* and being compelled to form butter-fat almost immediately from the food she consumes. As a matter of fact men of close observation who have had anything to do with the butchering of the Channel Island breeds of cattle have frequently drawn attention to the great amount of kidney and abdominal fat which is present in cows of these breeds, even though they do not appear to be very fat in the body, thereby showing a tendency to store fat in places where it can be most readily drawn on without seriously affecting the general condition of the body. We have all also noticed that when a cow comes to the dairy in good condition, if she is a true dairy cow, she will quickly reduce her condition no matter how much succulent food she gets. This goes to prove that in addition to the fat supplied by food the cow is drawing on her body fat. There is another way of looking at the question, viz., that when a cow is in good condition she does not require quite so much food as if she were in low condition in order to meet the requirements of her body as well as requirements of milk supply. We get the following fact established at any rate, viz., to do her best work a cow must come in to the dairy after calving in really good condition, and if through overstocking or through adverse seasons dairy cows come in at spring-time in low condition they are not in a position to do themselves justice, and consequently the farmer receives a decreased yield in butter-fat. The dairy-

farmer in the British Isles who has nearly all his cows calving in the spring has to make provision during the winter for the dry cows to be kept in good condition. Unfortunately, in New South Wales, too many of our dairy-farmers neglect to make the necessary provision, and hence every spring we see in some districts dairy cows coming in in such a lean condition that they are placed at a disadvantage for the whole of the following lactation period.

This is where the conditions which prevail on the Murrumbidgee irrigation area favour the dairy-farmer. The very best growth of natural herbage and pastures is during the autumn and winter, and cows that calve in the spring should always come in in high condition. On the other hand, the cows that calve in the autumn can be easily kept in condition by the fodder crops and pastures grown on the irrigable land, and these autumn-calving cows produce milk at a time when butter is at its highest value in that district, and generally speaking in Australia.

Probable effect of Climate.

It is worthy of note that cattle of warm climates naturally, even in their unimproved state, yield milk extremely rich in butter-fat. Probably the best illustration of this is afforded by the native cattle of India. There the work of the authorities who have set out to improve the cattle from a dairying point of view is not in the direction of endeavouring to get a rich milk, but rather to get a poorer milk and a greater quantity thereof. The native cattle do not yield much milk, but yield a product extremely rich in butter-fat. Climate, of course, cannot bring about that result immediately, but those who have made observations on the milk yield and butter-fat content of such milk when cattle have gone through a rainy period of two or three weeks, without being housed, will be aware of the great shrinkage which takes place during such wet weather. The cows fall off in milk yield, and it takes some time again before they can be got back to their normal possible records. In a district where the rainfall is so small as at Yanco or Wagga, cows suffer very little indeed from wet periods, because these are of such short duration.

These are the reasons why, in my opinion, after making all the observations and comparisons possible from the data at my disposal, that the cows that have been used for dairying in the Yanco district have yielded milk so very rich in butter-fat, and at the same time have yielded such good quantities of milk.

Comparison with other Irrigation Areas.

When in Victoria recently I made inquiries into the irrigation settlements there, and one thing which struck me forcibly was the fact that on the new irrigation area at Werribee, which is within a few miles of Melbourne, the main industries being recommended are lucerne-growing and dairying. This land cost about £13 an acre when resumed, so that when the costs of getting the water brought there, and the water rate, are added to

this item, it will be seen that land will have a high value, and hence good returns must be obtained in order to make ends meet. The fact that the Irrigation Commissioner is recommending lucerne-growing and dairying on the Werribee area is one to which Yanco settlers who have not made up their minds what industry they will develop most, should give careful consideration.

The Bacchus Marsh irrigation area and the method of farming pursued there goes still further to support the contention that dairy-farming, with lucerne as a basis for cattle food during the summer months, is one of the most, if not the most, profitable ways to farm irrigated lands.

On making detailed inquiries into the Bacchus Marsh irrigation area, I received information from a reliable source which rather astonished me. For instance, although Bacchus Marsh is within 31 miles of Melbourne, the lucerne which is grown there is mostly fed to dairy cows. By doing this, of course, the farmer retains the fertility of his land much longer than if he sold the lucerne to be consumed off the farm; it also goes to show that the same high prices do not obtain for lucerne in Melbourne as we experience from time to time in Sydney. Despite the fact that high prices are not obtainable for lucerne, however, the irrigable land at Bacchus Marsh is valued at from £60 to £100 per acre, and a rental of £5 per acre per annum is obtained by the land-owners. In addition to this, there are extra charges for water, which the tenant has to pay. At the present time there are on the Bacchus Marsh area about 900 acres under irrigation, about 1,400 acres of irrigable land which have not yet been irrigated, and about 700 acres of land not irrigable. Almost every farmer has some irrigable and non-irrigable land. Lucerne is grown, and the greater proportion of it is cut and hand-fed to the cows about two days after cutting. There are about eighty farmers, and about 1,600 dairy cows on that area. There is a Condensed Milk Factory in the district, and it speaks well for the quality of the milk when it is accepted for condensing purposes. The fact that the lucerne is allowed to wilt or dry for a couple of days before it is fed to the cattle is sufficient to prevent this fodder tainting the milk to any material extent. This is good news for Yanco settlers, because the milk-condensing industry is growing in Australia, and it is not at all improbable that milk will be condensed on the Murrumbidgee area before many years.

Comparative Water Rates.

In the *Bacchus Marsh Express,* dated 4th October, 1913, conditions as to water supply and the charge for water are published. These are as follows:—

By-law No. 399.—*Irrigation Charge, Bacchus Marsh Irrigation and Water Supply District.*

The State Rivers and Water Supply Commission, in pursuance and exercise of the powers conferred by the Water Acts, doth hereby make the by-law following:—

The following irrigation charge is hereby made, and shall be levied upon the occupiers or owners of all lands to which water rights have, under the provisions of the Water Acts, been apportioned by the Commission within the Bacchus Marsh Irrigation and Water Supply District, which district is by

notice given in the *Government Gazette* of 6th August, 1913, declared to be supplied with water for irrigation under the provisions of the said Acts:—

For the supply of water for the irrigation lands to which water rights have been apportioned as aforesaid, an irrigation charge of 20s. for each and every acre foot of water apportioned to such lands as water rights.

Such charge is made and shall be levied for the period beginning with the 1st day of October, 1913, and ending with the 30th day of April, 1914, and shall be payable on the 2nd day of October, 1913, at the office of the Commission, at Bacchus Marsh.

The charge for the supply of water for irrigation of all lands during the period from the 1st day of May to the 30th day of September every year (beginning with the year 1914) shall be:—

For stored water, 10s. for each and every acre foot of stored water supplied.

For unstored water, 5s. for each and every acre foot of unstored water supplied.

The rates charged by the Murrumbidgee Irrigation Commission, as may be seen previously, are immeasurably cheaper than those at Bacchus Marsh. Settlers and intending settlers who have any knowledge of the dairying industry may draw their own conclusions from these comparisons. One is forced to ask oneself if dairy-farming can be made pay at Bacchus Marsh under the conditions stated why should it not be a most excellent proposition at Yanco? Is Bacchus Marsh land so immeasurably superior to that at Yanco that the net results obtainable at Yanco should not be very much better than at Bacchus Marsh? From an inspection of both lands, I feel quite certain that the economic possibilities are all in favour of the farmer carrying on dairying at Yanco, under the present rental rates and water rates.

Impressions of Visiting Dairy Instructors and Dairy-farmers.

About the middle of September a number of dairy-farmers from different districts in New South Wales, together with the Departmental dairy instructors who are stationed in different parts of the State, visited the Murrumbidgee Irrigation Area. Each dairy instructor was asked to put in writing his impressions of the irrigation area, and whereas it is not possible to give at any length these impressions, a short extract from each will show the trend of their opinion.

Mr. Ballhausen, Dairy Instructor on the Richmond River, writes:—

Having for some years been intimately associated with dairying conditions on both the South and North Coasts, and knowing what an element of uncertainty the question of profit to the average tenant-farmer is owing to the, in very many cases, excessively high rentals, to the uncertainty of the rainfall at the right period of the year, and frequently to the poor response to rain by failing pastures, and bearing these matters in mind and looking at Yanco as it is to-day, with its comparatively cheap rentals, certainty of returns, luxuriant natural winter pasture, ample provision for summer fodder, and agreeable conditions of living, there is, in my mind, no more sound dairying proposition.

Mr. F. Wigan, who has had experience as a dairy-farmer, and who knows New South Wales intimately, states:—

A farm on this area as a proposition for dairying appeals to me as excellent. Knowing the whole of the coastal areas very thoroughly from visiting many of the farms right along from the Tweed River to Bega, and comparing these with what I saw at Yanco, I am satisfied that Yanco does not suffer by comparison. I would advise those men paying high rentals, and sometimes on short leases, to inspect Yanco as soon as they can. The irrigable land is capable of producing large quantities of green fodder, lucerne, &c., while the non-irrigable areas at certain periods of the year are thickly covered with herbage and grasses.

Mr. Matthew Wallace, Dairy Instructor, Bega district, writes:—

As a dairying proposition few places offer such advantages as Yanco. All round the district the cattle were in splendid condition, and this on the natural winter herbage, without irrigation. One of the principal advantages the district offers is that abundance of feed can be grown in the dry summer months by irrigation. To the settler who desires an early return for his labour, there is perhaps no other way in which success will attend his efforts so quickly.

Mr. Hampshire, Dairy Instructor for the Macleay and Hastings district, writes:—

Yanco presents one of the best propositions, from a dairying point of view, I know of—that is, dairying on intelligent, economic lines. A farm with 50 acres irrigable and 150 acres non-irrigable land is a fine proposition, and should be able to milk from fifty to sixty cows without the slightest fear of shortage of feed. That cows do well at Yanco is undoubted. I saw Jerseys fat and sleek in September, and yielding very heavily. On the coast at this period of the year cattle look anything but well. The Yanco cattle have, therefore, the advantage of coming in in the spring in high-class condition.

The next Subdivision.

For reasons not quite clear, New South Wales dairy-farmers gave no attention to the first subdivision on the Murrumbidgee Irrigation Area. The matter does not appear to have been brought fully under their notice, no doubt because of the fact that in New South Wales there had been practically no experience of dairy-farming under irrigated conditions. The fact remains, however, that our dairy-farmers missed their opportunities in the first subdivisions, but there will be a large subdivision of the beautiful Gogeldrie property within a few months, and I trust, in the interests of New South Wales farmers and their sons, that they will take the trouble to inspect this subdivision before the best of it is gone. It must be borne in mind that at the present time there is not a farm vacant, so far as I know, on the present subdivision that has been gazetted, unless it is one that has some flaw of greater or less extent. There will be a few farms, I understand, gazetted before the Gogeldrie subdivision takes place, and these are well worthy of the attention of dairy-farmers.

Money Required to Begin.

Owing to the very liberal terms which the Government have made available for intending settlers on the area, a man with Australian experience, and who has help in his own family, could make a start on a 50-acre irrigable farm with, say, 50 acres of non-irrigable land adjoining, on £400; but if he has not got experience, and in addition has not got help in his own family, then he requires a considerably larger sum, something more like £600 or £700.

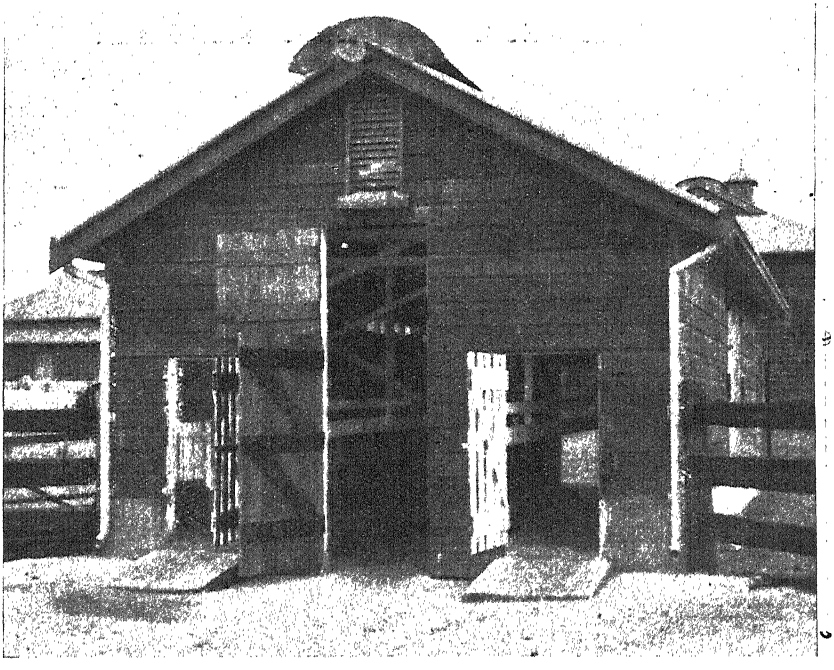
Judging by available records at the Experiment Farm at Yanco, and from the records available from other cattle on the irrigation area, I have estimated that dairy cows that are properly handled on the Yanco irrigation area should yield about 50 lb. of butter per annum more than cows of a similar type would yield on the coast, taking one season with another, unless, of course, the dairy-farmer on the coast takes care not only to provide his cattle with plenty of succulent food during winter months and times of drought, but also to provide them with shelter during rainy periods.

Echelon Milking Stalls.

At Hawkesbury Agricultural College.

H. D. BARLOW, Dairy Instructor.

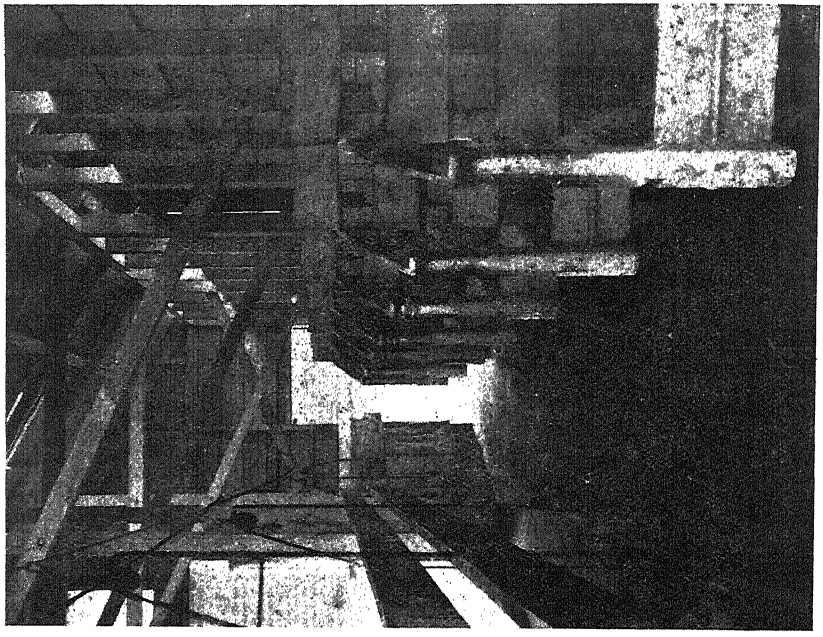
Compared with our old bails, the Echelon Milking Stalls show to considerable advantage, especially in the fact that a comparatively small building (31 feet × 16 feet) is all that is required to milk sixteen cows at a time. Since this building can be built and fitted up for from £100 to £130, according to locality, it is well worthy of consideration as an effective and comparatively cheap building for milking purposes.

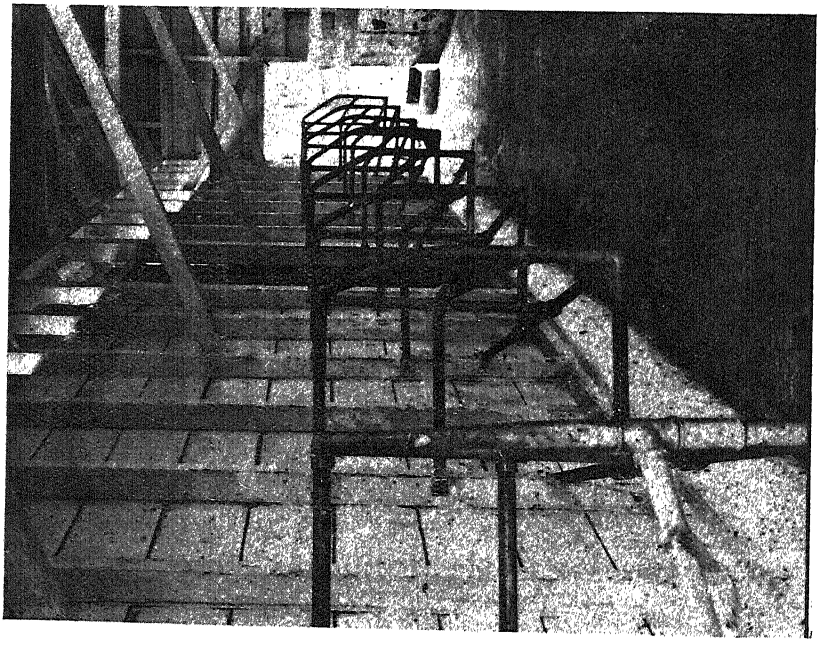


Echelon Bails at Hawkesbury Agricultural College.

Originally the "Stalls" were made of wood, the uprights entering the concrete floor, but they are now constructed of iron piping, which is bolted to the wall, and the floor is thus left free from obstruction, a decided advantage when cleaning.

The construction of the floor is rather different from the usual method, as the expense has been cut down as low as possible by filling up with packed sand, and putting 2 inches of reinforced concrete on the top.





Kohelon Bails at Hawkesbury Agricultural College. Showing tubular construction of bails on left and wooden partitions on right.

There might be some doubt as to whether 2 inches of concrete would be sufficient for the cow-floor, but so far, during our experience, it has shown no signs of cracking

The cows take to the new order of things quite naturally after the first few milkings, and it is noticeable that they stand much more quietly, and are not so easily excited. This is probably due to the fact that they are close together.

Although we use a leg-rope on all the cows in our old bails, only in one or two instances has this been necessary in the "Echelon" stalls, and there is no doubt that this method of handling the cows tends to make them quieter.

As half the cows are milked on one side and half on the other, hand-milkers will probably find it awkward at first, but for machine-milking the cows are in a very convenient position, since being all close together, very little shifting of the machine is necessary.

The fact that one lot of cows can be got in while the others are being milked affects a material saving in time, especially where a number of cows is to be milked.

Another great advantage is that the separating room can practically be made part of the same building as the bails, and thus all unnecessary carting of milk can be done away with; and if milking machines and a "Releaser" plant are installed the labour is reduced to a minimum.

On account of the position which the cows are in (one almost behind the other) we have been asked whether they are liable to dirty each other or the milker.

Our experience has been that only in one or two instances has this occurred.

The tendency to do this would probably occur more often when the cows were feeding solely on green stuff, but under normal conditions there is practically no trouble from this source, and it is surprising to note to what a small extent the cows will soil the floor if taken quietly.

With a herd of different sized cows it is advisable to so arrange them that two or three small beasts do not come together, as, if so, they will probably have too much space to move about. With old, quiet cows, there is very little risk of this, but heifers, which have only been milked a few times, are inclined to move if able to do so and thus disturb the other cows and make milking difficult.

If the large and small beasts are well distributed no trouble need be feared.

Several inquiries have been made as to whether there is any danger of the cows horning each other whilst in the stalls, but if the building is properly constructed this is impossible, and even when the cows are going in and out we have had no inconvenience from this source, although our herd, as a whole, is inclined to be pugnacious.

The standard building for the "Echelon" stalls is of weatherboard with the walls open about 2 feet along the top for ventilation, but the building at the College has been fitted with a sliding door in the middle of each side, and when not in use these doors are opened and allow more light into the building.

The roof is also fitted with two glass fanlights.

The advantages of the "Echelon" milking stalls may be summarised as follows :—

Less shed space is needed to milk a number of cows at the one time.

Owing to the construction of the floor and the small surface used by the cows, less labour and water is required when washing down.

The cows seem more contented.

The milking can be done more quickly and except in unusual cases no leg-roping is necessary.

The centre of the floor space is always clean as the cow floor is on either side.

The "Devil's Grip" in Sheep.

This term, "Devil's Grip," is one generally used to signify the depression in the back of a sheep, appearing behind the shoulders. The presence of this defect is more common in the Merino than in any of the improved types of the British breeds.

Its cause is due mainly to an anatomical defect. A rising of the shoulder-blades and the defective formation of the ribs is generally accountable for the trouble. Usually the defect will be found associated with small-frame fine-wool types of sheep rather than with heavy-bodied coarse-wool types. It may generally be taken as the first sign towards a delicate and weakening constitution. The best thing to do is to exclude from the flock all animals with the most marked forms of the defect, retaining those which have well-sprung ribs, broad chests, and straight backs.

The trouble may be said to affect the value of the wool directly. An animal that is defective in conformation cannot retain the same strength of constitution as can a properly formed one. The latter is more vigorous, and hence produces a better class of wool. On the particular portion of the body upon which the "grip" appears, a weakening in the production of the wool will always be noticed. Usually it is very open in growth, and does not display the same uniformity as the wool on other parts of the body.

A judge would be acting quite correctly in rejecting sheep exhibiting the defect referred to.—J. W. Mathews.

Storage and Marketing of Cheese.*

MATTHEW WALLACE, Dairy Instructor.

In a paper at the last meeting of this Association I endeavoured to point out some errors in cheese-making, and only incidentally touched on the storage of cheese in the factory curing-rooms.

It will be the purpose of this paper to invite attention to the present system of storing and packing cheese for market.

Perhaps the most unsatisfactory feature of the cheese industry at present is the poor provision made at many factories and farms for the proper regulation of temperatures in the curing-rooms, and the consequent loss of weight and damage to the quality of cheese made during the hot months of the season.

There is an idea all too prevalent in some quarters that any kind of room is good enough to cure cheese in, and if, during a spell of hot weather, the cheese sweats, and the fat runs on to the floor, it is taken for granted that this is something which must be endured and which cannot be prevented.

A crusted conservatism seems to pervade some men engaged in the production of cheese, and while any improvement in other branches of the farm engages their eager attention, anything seems good enough for the cheese.

It is also argued that cheese, and even "good" cheese, has been produced under these conditions, for twenty years, and they cannot or will not see any reason for improvement now. This statement does not apply to all cheese-makers. There are factories and some farms with excellent curing-rooms, where, even in the hottest weather, the temperatures remain normal; but, unfortunately, this is not the case in a large number of cheese-making establishments, where the cheese-room is only a weatherboard structure, in some instances without even lining on the inside of the walls.

The condition of the cheese in these rooms with the thermometer standing at 100 degrees Fah. outside can be easily imagined.

It will be argued that the isolated situation of some farms, where only the milk of one dairy is made up, makes the provision of a suitable room impossible, and that the cost is more than the average farmer can afford.

To that argument I cannot agree; the cost of insulating a small room sufficiently large to hold the cheese produced is a comparatively small item compared with the money lost yearly through cheese being overheated.

It has been calculated that this preventable loss is from 2½ to 3 per cent. on loaf cheese, and slightly less on large sizes.

* Paper read at the Eighth Annual Conference of the Co-operative Dairy Factory Managers and Secretaries' Association.

A factory making on an average 300 gallons daily would produce approximately 45 tons of cheese in a year. Each 14-lb. cheese would lose about a quarter of a pound, making a total loss of 1,800 lb. of cheese, which, valued at 6d. per lb., amounts to £45.

This does not, however, apply to the winter months; but taking into account the further loss during carriage to market, the total loss will exceed the sum named, and it is a conservative estimate to say that the total loss on this quantity of milk would greatly exceed £1 per week for the season, for it has to be borne in mind that cheese which has over-heated in the curing-room suffers more during transit than cheese which has been cured at normal temperatures.

By having the walls and ceiling of the curing-room properly insulated, the temperature can be regulated and the loss reduced to a minimum.

Where comparatively small quantities of milk are handled, a good plan is to have the floor of the curing-room sunk 6 or 8 feet in the ground, which assists in regulating the temperature.

In such cases good drainage is necessary, or trouble from moulds may be experienced.

This is not so convenient in large factories, where the cheese is carried from the making-room to the shelves on a trolly.

Wooden buildings can be insulated by having the walls and ceiling packed with charcoal to a thickness of 10 or 12 inches. Sawdust may also be used for the purpose where there is no trouble with white ants.

Walls built of brick, with an air space between the outer and inner courses, or hollow concrete blocks, are very suitable.

In providing for the regulation of the temperature in curing-rooms a sub-earth drain is of great service. This consists of a drain entering the earth at some distance from the curing-room, with an opening in the room at the level of the floor. The drain should be deep enough in the ground to cool the air which passes through into the curing-room. The deeper the drain the more efficiently will it cool the air, and less length of drain is required.

The length and depth of the drain depend to some extent on the situation of the factory, the position with regard to the prevailing air currents, and whether the curing-room is partly sunk in the ground. A good drain, constructed from 30 to 50 yards long and from 6 to 10 feet deep, will reduce the temperature of the outside air about 20 degrees with proper regulation. The outside opening of the drain should be provided with a cowl or other contrivance, and a shutter should be placed inside the room to block the drain during the prevalence of hot winds.

Ventilators placed in the walls near the floor and in the ceiling, so that they can be closed if necessary during the daytime and opened at night, materially assist in reducing the temperature.

Cheese kept at a temperature of 60 degrees Fah. will cure normally, and very little sweating will take place until a temperature of over 70 degrees Fah. is reached.

Next in importance to the temperature of the curing-room is the treatment which the cheese receives from the time it leaves the factory until it is marketed.

Many of us are familiar with the greasy, battered condition in which cheese arrives at the Sydney wharves or the railway station during the hot months of the year, and loud are the complaints against the shipping companies and the railways, and, as the truth must be told, a good deal of it is justified.

One of the conditions which determine the manufacture of cheese in certain districts is their isolation, and this consequently means that days and sometimes weeks must elapse between the time the cheese leaves the factory and reaches its destination. This applies more particularly where carriage is by ship, and if, as frequently happens, the ship fails to call for some reason or other, cheese which has been perhaps two days on the road in the hot sun is left for days in an oven-like corrugated iron building on the wharf before being shipped.

From personal observation on the South Coast, I can testify that as much care is exercised in the loading of cheese as is usually bestowed on blue metal, and cheeses cracked, dented, or otherwise damaged in loading are again stacked in tiers in the hold of the ship, and after further undergoing the process of unloading, few makers would recognise in the battered, greasy masses the sound cheeses which left their rooms perhaps a week previous, except for the partially-obliterated brands.

The rough handling is bad enough, but very often ordinary sanitary precautions are entirely lacking, and it is no unusual thing to see the same basket in which the cheeses are loaded bearing its burden of hides from the wharf to the ship's hold—in fact, it serves as a general carry-all.

While I am compelled to thus bear witness against the shipping companies, the railways are far from blameless. On one of my visits to a factory, I was shown photographs of a portion of a consignment of cheese, which arrived in Sydney broken and battered out of shape, and was informed that the cash loss on a 3-ton lot was over £70. What satisfaction, if any, was received from the Railway Commissioners I have not heard.

During the recent Royal Show I was requested to inspect a shipment of cheese from the South Coast. The weather was exceptionally warm, and the condition of the cheese on arrival in Sydney worse than usual, but it is no exaggeration to say that the whole shipment was damaged to the extent of 2d. per lb., with the exception of a consignment which arrived in crates.

Whatever improvement is effected must come from the cheese-makers themselves, as past experience shows they have little to hope for from the carrying agencies, and that can only be brought about by having the cheese carried in crates during the hot months of the year.

Some factories adopt this method of packing at present with generally satisfactory results, and it will be to the advantage of other factories to follow suit.

The extra cost of crating is about the only argument against the system being universally adopted; but this should not deter makers from using the only means at present in their power of having their produce put before the public in a sound and presentable condition.

Crates to hold 100 lb. of cheese (four 25-lb. cheeses), can be procured for 1s. 10d. each, less than one farthing per lb., and as they can usually be relied upon to do at least three trips, the cost is very small indeed, and more than counterbalanced by the absence of damaged cheeses and the higher price received for them.

I am aware that where cheese is carted by contract the back carriage of the crates is some obstacle, as being bulky they take up space to the exclusion of other loading, but even this difficulty should not prove insurmountable.

Cheese-makers who already use crates state that they would continue to use them during the hot period of the year even if the cost were greater than at present.

Competition will become increasingly keener, and those who do not make up their minds to go forward will have only themselves to thank if they find themselves going back.

At the present time there is a movement in certain quarters to start cheese-making, and I would like to impress on those contemplating this step, that unless they are prepared to properly equip their factories, and determined to produce nothing but the highest-quality cheese, they should hesitate before beginning to further contribute to the already overstocked market of second-rate produce.

It is this article which tends to lower prices, and the difference in the price of good and inferior cheese is becoming relatively greater each year, and should rightly continue to do so.

There is always plenty of demand at good prices for first-quality produce of any kind, and the motto of cheese-makers should be, "None but the best," and I earnestly appeal to the farmers, who supply milk to the cheese factories of this State, to spare no trouble in producing clean, sound milk, and so assist to what extent they can those whose duty it is to manufacture the cheese.

Cow's Milk for Lambs.

Cow's milk is apt to be too strong for lambs during the early stages of their growth, and in using milk in this way it would be advisable to dilute it with water, beginning with equal quantities of water and milk, and gradually reducing the proportion of water until none is required. As milk contains all the natural properties for the maintenance of life, it is not necessary to add salt to it.

The best way to feed the milk is through a teat similar to that on a baby's bottle. Half a pint would be sufficient to give the lamb at one time, increasing the quantity as the animal grows stronger.—J. W. Mathews.

Field Experiments with Wheat, 1912.

DETAILS of these experiments up to the end of the season 1911 were published in the *Gazette* last year. The present series of reports embraces the season 1912.

The Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that final conclusions cannot yet be drawn from these trials, as they have only been conducted for a few years or less. Later, when results for, say, five years are available, a summary will be prepared, as sufficient evidence should then be available to enable conclusions to be formed. Meanwhile, it is felt that the public are entitled to know the results obtained each year.

III.—A FERTILISER TRIAL (PHOSPHORIC ACID SERIES).

[For report for 1911, see *Agricultural Gazette*, August, 1912, page 645.]

Object.—To determine the most suitable and economical source of phosphorus to use as a fertiliser for the staple and rotative crops of the different districts in which the experiment is planted, *i.e.*, to determine the effect of climate upon the availability of the phosphorus in the different commercial phosphatic manures.

The following phosphatic manures are being compared with each other, viz. :—

(1) Bone-dust.
(2) Superphosphate.
(3) Rock phosphate.
(4) Bone charcoal.
(5) Thomas phosphate.

The relative and comparative value of the phosphorus from the different sources is determined by comparing the yields from plots fertilised with phosphorus obtained from the respective sources enumerated above with the yields from check plots which have not received an application of any phosphatic fertiliser.

In order that the effect of the application of the different phosphatic manures may not be influenced by a deficiency of nitrogen or potash, the nitrogen and potash content of each plot is maintained. The nitrogen content is kept up by the rotation adopted, the potash content by the application of sulphate of potash to each plot.

The amount of phosphorus and potash applied to any plot is what is considered sufficient to replace that removed by the system of cropping followed.

As bone-dust contains a certain percentage of organic nitrogen and the other phosphatic manures do not, it is necessary to add organic nitrogen to all the phosphatic fertilisers except bone-dust, in order to make the conditions uniform for all the fertilisers. This is done in the form of dried blood. The amount added is equivalent to that supplied by the bone-dust necessary to furnish the required amount of phosphorus.

The quantity of nitrogen, phosphorus, and potash added to the plots receiving such is the same for each.

The check plots do not receive any phosphatic manure, but as all the other plots, in addition to a phosphatic manure, receive (for reasons already stated) an application of nitrogen and potash, it is necessary to also apply the same amount of nitrogen and potash to the check plots.

As the check plots become depleted of their available phosphorus, it is considered that the effects of the application of the various phosphatic manures will become noticeable. The results can then be compared.

The actual differences due to the various fertilisers applied are not estimated by comparing the yields of the plots one with another, but by comparing the differences which exist between the actual yields of the plots and the yields which it is estimated they would have produced had they been planted as check plots. This estimate of "natural" yield is based upon the assumption that the differences between neighbouring check plots are due to regular and similar variations in the soil between them. The natural yield of any plot will, therefore, be intermediate between that of its two check plots, and proportionate to its distance from them.

COWRA EXPERIMENT FARM.

H. K. CHAPMAN, Experimentalist.

THIS experiment has been carried out in accordance with the general directions given above.

The rotation adopted is a two-course one, in which wheat alternates with a leguminous crop, the rotative crop grown at this farm being field peas. The rotative crop is a legume, in order to keep up the nitrogen content of the soil, attention being directed to this in the general directions given above. On account of the rotation, two blocks are required, those reserved being two portions of H VI.

Previous History of the Block.

This is fully described on page 647 of the *Agricultural Gazette* for August, 1912.

Preparation of the Ground.

The previous crop of field peas was harvested and threshed on the 8th January, 1912. Between the 15th and 17th January the land was disc-ploughed, but, owing to the hardness of the land, this ploughing was not very satisfactory.

A disc cultivation was given on the 17th May, and the ground was harrowed on the following day.

Planting.

The various plots, arranged as shown in Sketch A, were planted on the 20th May.

The variety of wheat used was Bunyip ("Stud," Cowra, 1911 harvest), and this was treated with a 2 per cent. solution of bluestone, and dipped in lime-water. The rate of seeding was 55 lb. per acre.

The quantities of fertilisers applied per acre to the various plots are shown in Sketch A. A uniform manuring providing the following amounts of plant food was used :—

Nitrogen ... ... 6 lb. (Dried blood, 44½ lb.)
Phosphoric acid ... 20 lb. (Superphosphate, 118 lb)
Potash ... ... 7½ lb. (Sulphate of potash, 14½ lb.)

The organic nitrogen applied was the amount supplied in the bone-dust, and this was supplied to all plots not fertilised with bone-dust, to render the comparison between the plots comparable.

Each mixture was made up to a certain bulk with sand, and this amount was ascertained by passing the manure through the drill, giving the wheel a certain number of revolutions.

When sowing plots 3, 4, and 6, it was necessary to sow twice, in order to apply the necessary amount.

Therefore, in order to make the other plots (Nos. 7 and 9) comparable with these, the drill was first run over the plots, empty, before sowing.

The plots were 16 links wide, to accommodate the width of the drill, which gives a space of 3·2 links between adjacent drills in each pair of plots. This is sufficient to prevent any diffusion of different manures. The crop was harrowed on the 17th September, 1912.

Observations during Growth.

The crop did not germinate till the middle of June. On the 4th of September it was noted that the best growth had been made by the plots manured with superphosphate, Thomas phosphate, and rock phosphate. Similar results with regard to the two former plots were also noticed both in 1910 and 1911.

The plots manured with superphosphate, rock phosphate, bone charcoal, and Thomas phosphate came out in head on the 5th October, 1912, while the other followed about four days later.

Harvesting.

Before harvesting, the plots were reduced to ·116 of an acre each, by removing the ends. The crop was harvested with the stripper, and winnowed, on the 11th December, 1912. From these results the yields were worked out.

Results.

Table I shows the results obtained in 1910, 1911, and 1912, and the average for the three years.

Taking this average and arranging them according to their percentage yields, the order of merit is as follows :—

(1) Thomas phosphate, percentage yield ... ... 107·03
(2) Superphosphate, ,, ,, ... 106·66
(3) Bone-dust, ,, ,, ... 104·23
(4) Unmanured, ,, ,, ... 102·44
(5) Rock phosphate, ,, ,, ... 100·60
(6) Check plots, ,, ,, ... 100·
(7) Bone charcoal, ,, ,, ... 99·19

Much better results, it will be noticed, were obtained with Thomas phosphate and rock phosphate in 1912 than in previous years. It will be interesting to see whether this result is borne out in future years.

EXPERIMENT III.—A Fertiliser Trial with Wheat, at the Cowra Experiment Farm, 1912.

Sketch A.

Length of each plot .. .. 800 links.
Width ,, ,, ... 16 ,,
Area ,, ,, ... ·128 acres.

1.	Unmanured.		DIVISION.
		lb. per acre.	
2.	Blood	44½	*Check.*
	Sulphate of potash	14½	
3.	Bone-dust	84	
	Sulphate of potash	14½	
4.	Blood	44½	
	Superphosphate	118	
	Sulphate of potash	14½	
5.	Blood	44½	*Check.*
	Sulphate of potash	14½	
6.	Blood	44½	
	Rock phosphate	72½	
	Sulphate of potash	14½	
7.	Blood	44½	
	Bone charcoal	66½	
	Sulphate of potash	14½	
8.	Blood	44½	*Check.*
	Sulphate of potash	14½	
9.	Blood	44½	
	Thomas phosphate	108	
	Sulphate of potash	14½	
10.	Unmanured.		
11.	Blood	44½	*Check.*
	Sulphate of potash	14½	
12.	Unmanured.		DIVISION.

Area of experiment, 8 chains x 1·92 chains = 1·536 acres.

TABLE I.—Showing the Results obtained from the use of Phosphatic Fertilisers.

Plot Number.	Fertiliser used on Plot.*	1910.			1911.			1912.			Average for 1910, 1911, and 1912.	
		Actual Yield per Acre.	Natural Yield per Acre.	Percentage Yield.	Actual Yield per Acre.	Natural Yield r Acre.	Percentage Yield.	Actual Yield per Acre.	Natural Yield per Acre.	Percentage Yield.	Actual Yield per Acre.	Percentage Yield.
		bushels.	bushels.		bushels.	bushels.		bushels.	bushels.		bushels.	
2	*Check Plot*	31·83	31·83	100	13·35	13·35	100	21·70	21·70	100	22·29	100
3	Bone-dust	34·50	32·66	105·63	13·05	13·35	98	23·42	22·08	106·05	23·66	104·23
4	Superphosphate	35·00	33·50	104·47	14·85	13·35	111	22·70	22·47	101·04	24·18	104·66
5	*Check Plot*	34·33	34·33	100	13·35	13·35	100	22·85	22·85	100	23·51	100
6	Rock phosphate	33·33	34·27	97·25	13·50	13·65	99	25·57	24·05	106·34	24·13	100·60
7	Bone charcoal	35·33	34·22	103·24	13·35	13·95	96	24·14	25·24	95·63	24·27	99·19
8	*Check Plot*	34·16	34·16	100	14·25	14·25	100	26·44	26·44	100	24·95	100
9	Thomas phosphate	36·00	33·72	106·76	14·25	14·00	102	28·02	24·80	112·96	26·09	107·93
10	Unmanured	36·00	33·28	108·17	13·35	13·75	97	22·56	23·17	97·35	23·97	102·44
11	*Check Plot*	32·83	32·83	100	13·50	13·50	100	21·55	21·55	100	22·62	100

* In addition to the phosphatic fertilisers mentioned, all the plots, except Nos. 3 and 10, received an application of dried blood and sulphate of potash. No. 3 received sulphate of potash only, as the bone-dust contains nitrogen. No. 10 was entirely unmanured. Sketch A shows the exact manuring. In this table the phosphatic manures only are given, as these were the manures compared, and which caused the differences in the yields.

WAGGA EXPERIMENT FARM.

R. W. McDIARMID, Experimentalist.

THE experiment was conducted on the same lines as in 1910 and 1911. The results this year are from the first application of the various phosphates to the ground.

Preparation of the Ground.

In 1910 this ground was occupied by the Variety Trial, while in 1911 the land was fallowing and well worked. The details of cultivation are as follow:—The land was ploughed with the double-furrow mould-board during the first week of October, and allowed to remain as ploughed until harvesting was completed. The one-way cultivator was used on the fallow during January, February, and March The depth of cultivation was approximately 3 inches, and all the working of the land was across the direction of the plots.

Planting.

The plots were the same as in previous years, and manured according to the original plan. All the fertilisers and mixtures were prepared and mixed with fine earth beforehand to ensure the exact amounts being applied to each plot.

The experiment was sown with Federation wheat at the rate of 40 lb. per acre, and the seed was treated with a 2 per cent. solution of bluestone, immersed for three minutes.

The experiment was sown on the 16th May, but did not germinate till about the middle of June.

Harvesting.

These plots were harvested for grain only. All were reduced to exactly one-fifth acre prior to harvesting by removing a small piece from each end. The binder was used to harvest all the plots, and later threshed out.

Results.

Immediately after germination, and right through the growing period, the plot fertilised with superphosphate looked the best. The plot of Thomas phosphate also looked well from early in the growing period. The other phosphates showed very little effect.

The results this season are very similar to those of last year, but the yield from Thomas phosphate more nearly reaches that of superphosphate than last year. The effect on the ripening of the crop of the Thomas phosphate is not so rapid as the superphosphate, and this appeared to be beneficial this year, for the rain came late in October, the critical month.

TABLE SHOWING RESULTS OF EXPERIMENT NO. III, WAGGA EXPERIMENT FARM, 1912.

Plots each one-fifth acre in area, and harvested for grain only.
Variety—Federation, 40 lb. per acre.
Sown—16th May, 1912.

Plot.	Manure per Acre.	Yield per Plot.	Acre Yield.	Natural Yield	Percentage Yield.
	lb.	lb.	bus.	bus.	bus.
1 (*check*)...	Sulphate of potash ... 29 Dried blood 21	139	11·58	11·58	100
2	Sulphate of potash ... 29 Bone-dust 63	211	17·58	12·05	145·9
3	Sulphate of potash ... 29 Superphosphate ... 88 Dried blood 21	351	29·25	12·53	233·4
4 (*check*)...	Sulphate of potash ... 29 Dried blood 21	156	13	13	100
5	Sulphate of potash ... 29 Rock phosphate ... 55 Dried blood 21	170	14·16	11·58	122·3
6	Sulphate of potash ... 29 Bone charcoal.. ... 50 Dried blood 21	199	16·58	10·17	163
7 (*check*)...	Sulphate of potash ... 29 Dried blood 21	105	8·75	8·75	100
8	Sulphate of potash ... 29 Thomas phosphate ... 81 Dried blood 21	245	20·41	8·75	233·2
9	No manure	122	10·16	8·75	116·1
10 (*check*)...	Sulphate of potash ... 29 Dried blood 21	105	8·75	8·75	100

Average yield of check plots = 10·52 bushels per acre.

Phosphates arranged in order of merit:—

1. Superphosphate.
2. Thomas phosphate.
3. Bone charcoal.
4. Bone-dust.
5. Rock phosphate.

BATHURST EXPERIMENT FARM.

J. W. SHAW, Experimentalist.

THIS experiment was carried out at this Farm, upon the same lines and the same objects in view as at other Experiment Farms.

Rotation and previous Treatment.

In January, 1911, the stubble was ploughed 4 inches deep with mould-board ploughs. The land then lay until March, when it was cross-ploughed

with skim-ploughs to the same depth. Rape was sown early in April at the rate of 6 lb. to the acre, no fertiliser of any description being applied with seed. Owing to the autumn being somewhat dry, the rape did not make very much headway until September, when it made fair growth. The crop was not fed-off but ploughed under early in November, when it was well in flower. In order to completely cover the rape, which ranged from 2 feet to 4 feet in height, a drag chain was used. The land then lay in this condition until January, when it was skim-ploughed 4 inches deep to destroy weeds and maintain the mulch. Just prior to planting the same operation was repeated, and the wheat sown on a newly ploughed seed-bed.

Manures.

Prior to planting, the manures were mixed with fine earth and run through the seed-drill in order to apply as nearly as possible the correct quantity per acre.

Planting.

The seed was treated with bluestone, 1 to 60, for five minutes, allowed to drain for a quarter of an hour, and then immersed in lime-water for a minute or so. Cleveland was the variety of wheat used, and was sown on the 15th of April at the rate of 30 lb. per acre.

Germination.

April and May proved exceptionally dry, only 20 points of rain being registered for the two months. The wheat was sown in the dry, and the manures applied directly with it. It germinated in patches, but the bulk of the seed lay in the ground until after the June rains, when every plot germinated very evenly. This goes to prove that, if wheat be sown in a dry seed-bed, and fertiliser be applied with it, no harmful effect will result from the seed and manure lying close in contact. Many farmers are of the opinion that it is not wise to apply fertiliser with the seed if the latter is to be sown in a dry seed-bed, but from the results obtained from the manure experiments last season this theory appears to have no foundation.

Young Growth.

The effect of some manures on the young growth was very marked in this experiment, although not so much as in Experiment No. IV. In plots Nos. 3, 6, and 8 the young growth was much ahead of the others; these plots received dressings of superphosphate, bone charcoal, and Thomas phosphate, which no doubt accounts for the differences in the young growth.

Harvesting.

Prior to harvesting the headlands were cut off, squared, and the plots reduced to an area of one-seventeenth of an acre. All the plots were harvested with the reaper and binder on the 23rd of December.

Results.

From the results given in the table, the manures may be classed in the following order of merit:—

1. Bone charcoal.
2. Bone-dust.
3. Superphosphate.
4. Thomas phosphate.
5. Rock phosphate.
6. Unmanured.

The results of 1912 are somewhat different to those of 1911. In that year superphosphate, Thomas phosphate, and bone-charcoal gave the highest percentages, but from the above it will be seen that bone-charcoal and bone-dust gave better returns. This experiment is only in its third year, and it is not yet safe to draw too many conclusions, but it appears that under certain conditions all the above-mentioned manures have some effect on the yield. The results obtained from superphosphate appear to be more consistent than with any of the other manures, but it is really too early to draw any final deductions.

TABLE SHOWING THE RESULTS OF WHEAT EXPERIMENT NO. III, AT BATHURST EXPERIMENT FARM, 1912.

Variety of Wheat: Cleveland.
Date planted: 15th April, 1912.
Date harvested: 23rd December, 1912.
Area of plots: $\frac{1}{17}$ of an acre.

Plot No.	Manure applied per Acre.	Plot Yield.	Acre Yield.	Natural Yield.	Percentage.
		lb.	lb.	bus.	bus.	
1 (*check*)...	Dried blood ... 54 Sulphate of potash... 14½	56	15·86	15·86	100
2	Bone-dust ... ... 91 Sulphate of potash... 14½	73	20·68	17·27	119·74
3	Dried blood ... 54 Sulphate of potash... 14½ Superphosphate .. 118	78	22·1	18·69	118·24
4 (*check*)...	Dried blood... ... 54 Sulphate of potash... 14½	71	20·11	20·11	100
5	Dried blood... .. 54 Sulphate of potash... 14½ Rock phosphate ... 63	74	20·96	19·73	106·23
6	Dried blood... ... 54 Sulphate of potash... 14½ Bone charcoal ... 67	83	23·51	19·35	121·49
7 (*check*)...	Dried blood... ... 54 Sulphate of potash... 14½	67	18·98	18·98	100
8	Dried blood... ... 54 Sulphate of potash... 14½ Thomas phosphate...112	74	20·96	19·35	108·32
9	Unmanured...	66	18·7	19·73	94·77
10 (*check*)...	Dried blood... ... 54 Sulphate of potash... 14½	71	20·11	20·11	100

The rainfall for the year was as follows :—

	Points.
January	150
February	96
March	9
April	14
May	6
June	265
July	452
August	305
September	87
October	189
November	100
December	27

Total = 1,700 points.

GLEN INNES EXPERIMENT FARM.

H. BARTLETT, Experimentalist.

THIS experiment was carried out at this Farm with Algerian oats.

The plots were 4·8 chains by 31 links, and two widths of the wheat drill were sown in each plot, making thirty drills, each 7 inches apart, leaving a space of 4 links between each plot.

Planting.

The seed was sown on 17th August, at the rate of 60 lb. per acre, the various manures being drilled in at the same time.

Notes on Growth.

From the very commencement of the growth the superphosphate plot showed out the best, and on 20th November this still led, followed by Thomas phosphate and rock phosphate. On 18th December the superphosphate plot was a few days earlier than the others, and bone-dust had improved a good deal.

Harvesting.

Just previous to harvesting the plots were reduced to a convenient size—namely, an eighth of an acre—by reducing the length of the plots. Half of each was cut for hay, and the other half for grain.

Comments.

The growth of the plot may be classed as medium, the yields not being nearly as heavy as last year. A much heavier application of fertiliser was given then, and this has since been reduced to a more commercial scale. The season this year was much drier than 1911.

TABLE SHOWING RESULTS OF OAT EXPERIMENT No. III, GLEN INNES EXPERIMENT FARM, 1912.

Variety: Algerian (for hay and grain). Size of Plot: $\frac{1}{16}$ acre each.

Plot No.	Manure per Acre.	Hay.				Grain.			
		Yield per Plot.	Acre Yield.	Natural Yield.	Percentage Yield.	Yield per Plot.	Acre Yield.	Natural Yield.	Percentage Yield.
1	BUFFER. lb.	lb.	t. c. q. lb.	t. c. q. lb.		lb.	bus.	bus.	
2 (*check*) ...	Dried blood ... ... 20 Sulphate of potash 11½	239	1 14 0 16	1 14 0 16	100	113	45·2	45·2	100
3	Bone-dust ... ... 68 Sulphate of potash 11½	214	1 10 2 8	1 15 0 5	87·24	152	60·8	46·27	118·58
4	Dried blood ... ... 20 Sulphate of potash ... ... 11½ Superphosphate 88	277	1 19 2 8	1 15 3 22	126·84	118	47·2	47·35	109·39
5 (*check*) ...	Dried blood ... ... 20 Sulphate of potash 11½	258	1 16 3 12	1 16 3 12	100	121	48·4	48·4	100
6	Dried blood ... ... 20 Sulphate of potash ... ... 11½ Rock phosphate 47	256	1 16 2 8	1 16 0 10	102·62	132	52·8	47·6	102·07
7	Dried blood ... ... 20 Sulphate of potash ... ... 11½ Bone charcoal 50	259	1 17 0 0	1 15 1 9	104·73	123	49·2	46·8	105·12
8 (*check*) ...	Dried blood ... ... 20 Sulphate of potash 11½	242	1 14 2 8	1 14 2 8	100	115	46·0	46·0	100
9	Dried blood ... ... 20 Sulphate of potash ... ... 11½ Thomas phosphate 88	248	1 15 1 20	1 12 3 12	107·83	124	49·6	45·85	108·18
10	No manure	258	1 16 3 12	1 11 0 16	118·35	113	45·2	45·72	98·85
11 (*check*) ...	Dried blood ... ... 20 Sulphate of potash 11½	206	1 9 1 20	1 9 1 20	100	114	45·6	45·6	100

NYNGAN DEMONSTRATION FARM.

H. J. KELLY, Manager.

WHEAT Experiment No. III was carried out at this Farm, together with the other experiments, in accordance with the general instructions issued by the Experiments Supervision Committee.

Owing to the very drying conditions which set in early in September, it was anticipated that grain crops would be a failure, and as more accurate results appeared likely to accrue from hay than from grain, it was decided to harvest the whole of the plots for hay.

The results appear in the appended table :—

TABLE SHOWING RESULTS OF WHEAT EXPERIMENT No. III, NYNGAN DEMONSTRATION FARM, 1912.

Variety : Firbank.

Area of plot : $\frac{1}{25}$ of an acre.

Plot No.	Manure per Acre.	Yield per Plot.	Acre Yield.	Natural Yield.	Percentage Yield.
	lb.	lb.	lb.	lb.	
1 (*check*)...	Dried blood... ... 15 Sulphate of potash... 14½	84	2,100	2,100	100
2	Bone-dust ... ... 54½ Sulphate of potash... 14½	80	2,000	2,158	92·6
3	Superphosphate ... 70 Dried blood... .. 15 Sulphate of potash... 14½	91	2,275	2,216	102·6
4 (*check*)...	Dried blood... ... 15 Sulphate of potash... 14½	91	2,275	2,275	100
5	Rock phosphate ... 37½ Dried blood ... ... 15 Sulphate of potash... 14½	89	2,225	2,266	98·1
6	Bone charcoal ... 40 Dried blood... ... 15 Sulphate of potash... 14½	64	1,600	2,258	70·8
7 (*check*)...	Dried blood ... ... 15 Sulphate of potash... 14½	90	2,250	2,250	100
8	Thomas phosphate... 66⅔ Dried blood... ... 15 Sulphate of potash.. 14½	93	2,325	2,083	111·6
9	Unmanured...	86	2,150	1,916	112·2
10 (*check*)...	Dried blood... ... 15 Sulphate of potash... 14½	70	1,750	1,750	100

WARTS ON A HORSE'S NOSE.

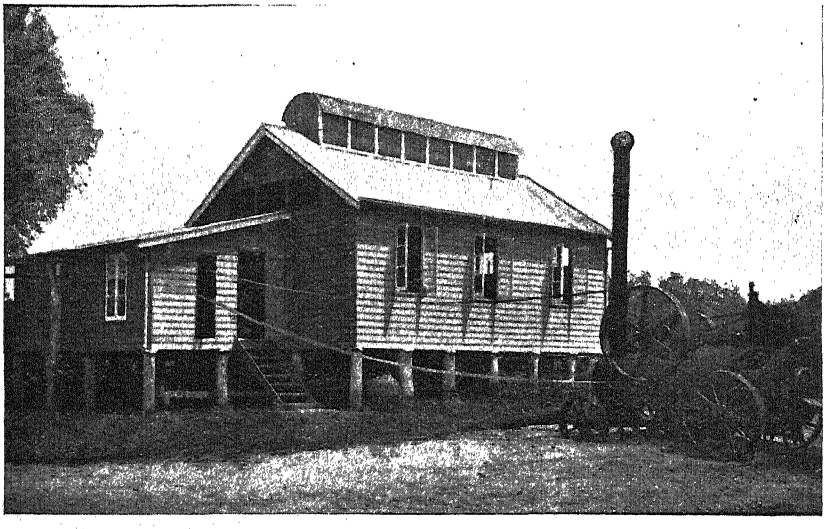
As in the case submitted to us the warts are half an inch long, each should be taken separately and twisted off with the fingers and thumb, after which the roots should be painted once daily for five consecutive days with nitrate of silver.—*Veterinary Officers of the Stock Branch.*

Shearing Shed at Bathurst Experiment Farm.

R. W. PEACOCK, Manager.

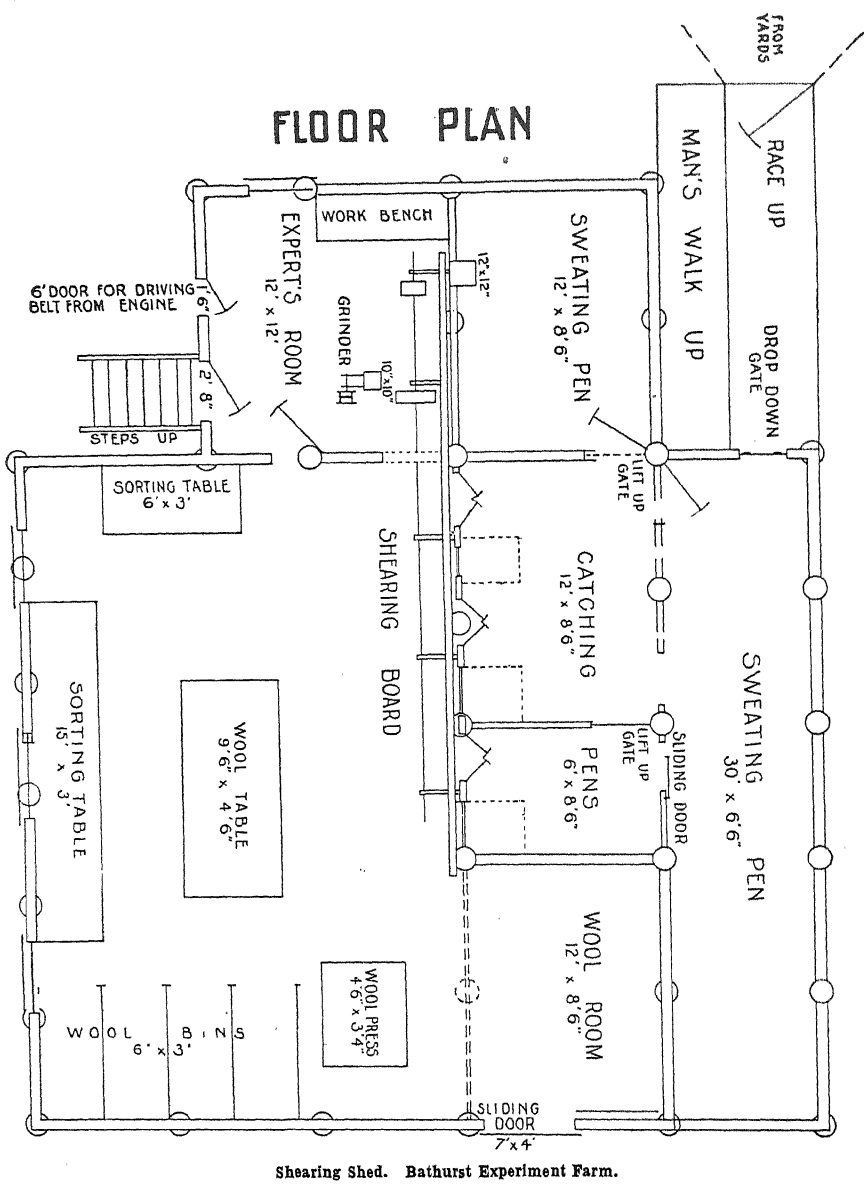
OWING to the many applications for particulars respecting the shearing shed at this Farm, it has been deemed desirable to publish the plans, together with the main features.

The shed has proved very suitable for dealing with the small flock on the Farm and for instructional work with students during shearing and throughout the year. A design was evolved which was thought would prove valuable for others to copy, with possible modifications to suit local requirements, and would also prove of value to students who might eventually erect one of their own. The design embraces much that was old and a little that is new, and it is hoped that the result is a model shearing shed for small holders.



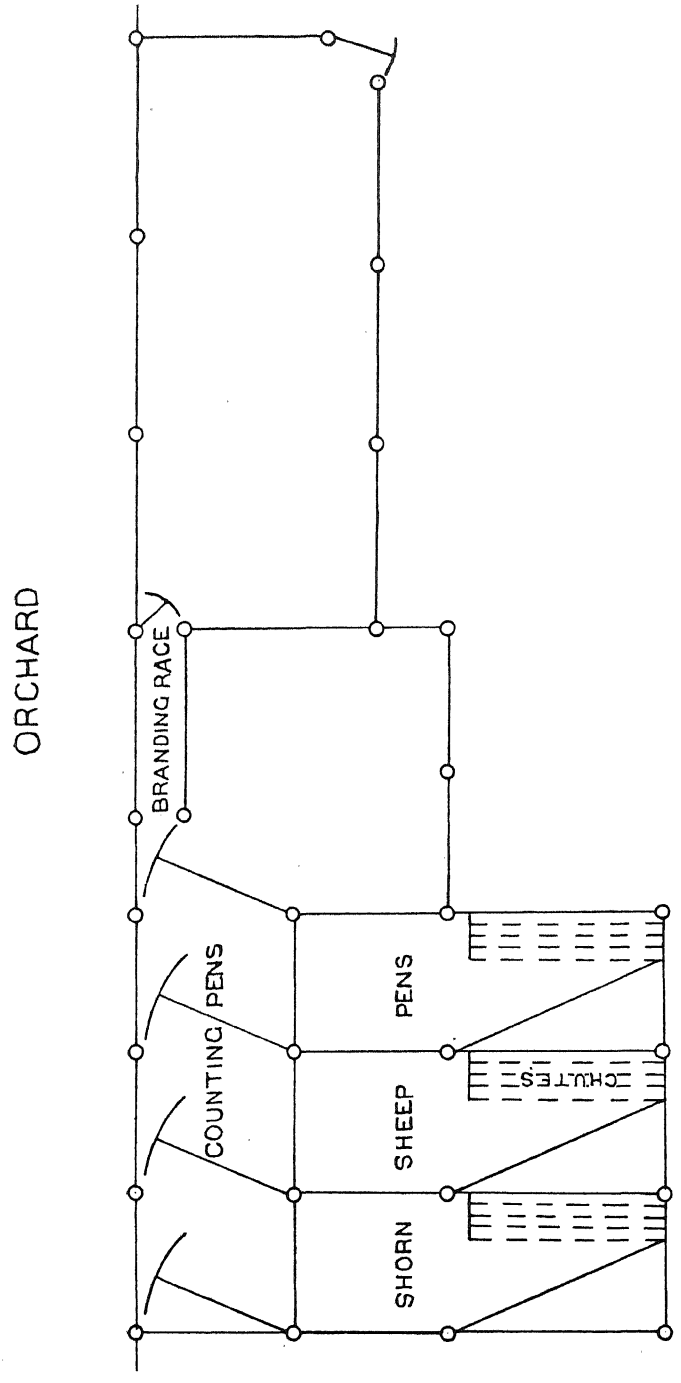
Shearing Shed at Bathurst Experiment Farm. Exterior view.

Plans were drawn and the work was carried out by Mr. A. Brooks, Overseer of Works of the Department, in 1908. He, together with the writer, visited the shearing shed of Messrs. Anderson Bros., of Killingbutta, to obtain many practical hints which were incorporated. My thanks are due to these gentlemen for the information supplied, and also to other pastoralists for suggestions.



Shearing Shed. Bathurst Experiment Farm.

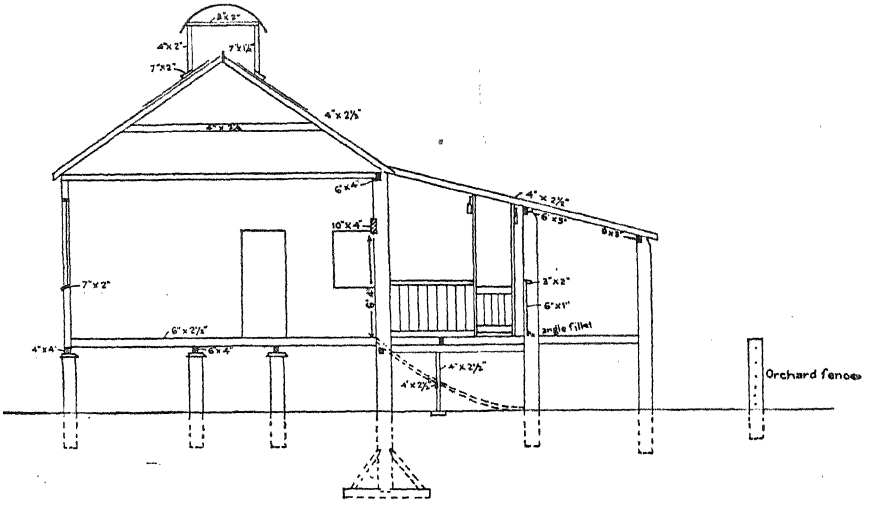
The shed was fitted into a corner of the site for buildings, and the roads were arranged in relation to the site. The building was placed 4 feet off the ground, in order to provide shelter for the unshorn sheep from storms during shearing time. Woolly sheep can be sheltered under the floor of the shearing board and wool-room, as well as in the receiving and catching pens. The height off the ground allows of dealing with the shorn sheep by passing them



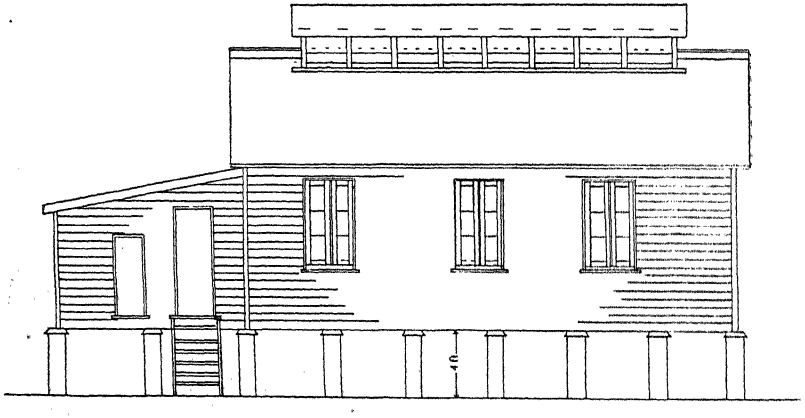
PLAN of PENS AND YARDS UNDER SHED

Bathurst Experiment Farm.

down chutes underneath the catching pens. Ample room is provided for handling the wool, and excellent lighting has been provided. This latter was essential for wool-classing by students throughout the dull winter weather.



CROSS SECTION



FRONT ELEVATION

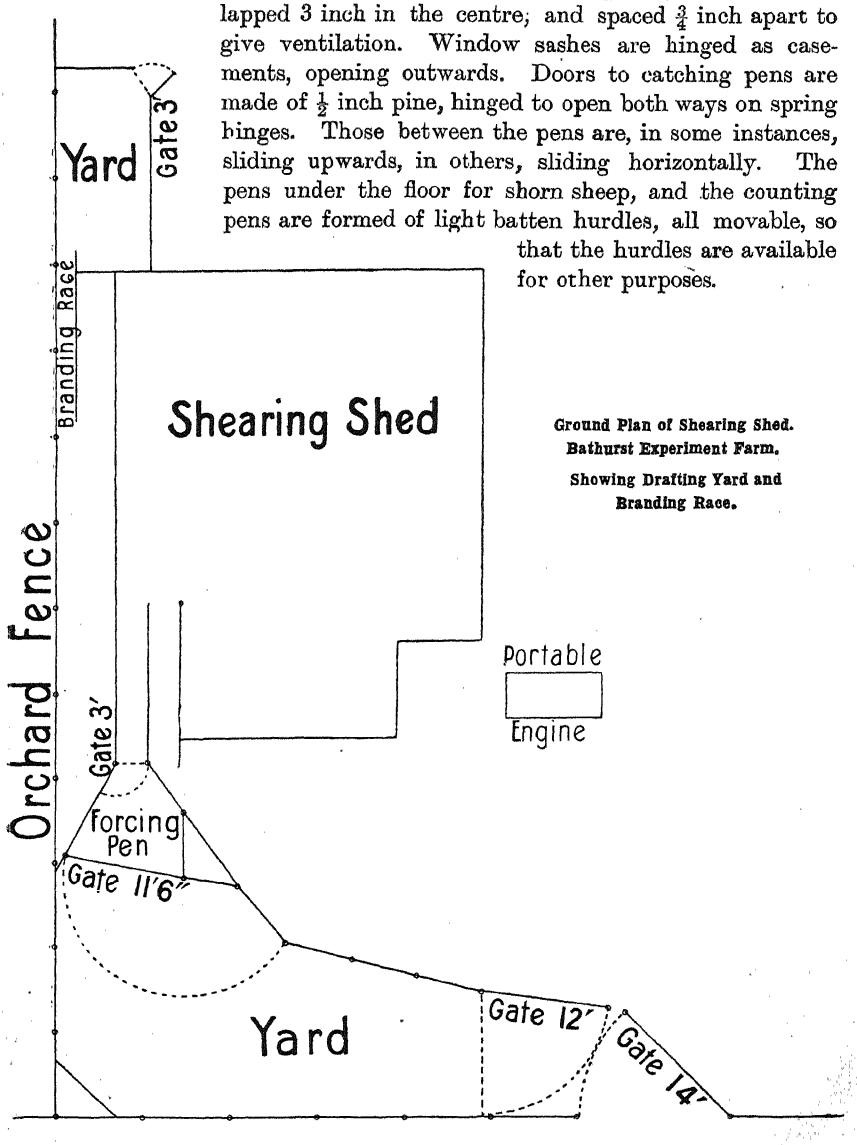
Shearing Shed. Bathurst Experiment Farm.

The building cost £228. A much cheaper building could be erected where round timber, &c., was available. The sweating pen marked × could be dispensed with as it is not so necessary.

Three stands of "Wolseley" machines have been installed.

The following notes by Mr. A. Brooks will be found of value.

The building is entirely constructed of sawn timber, with roof of corrugated iron. The floor is elevated 4 feet from the ground on round piles, capped with galvanised iron as a preventative against white ants. The walls are of studs and splayed weather-boards, the floors of shearing board and wool room are of T. and G. pine, and in the pens of 2 in. x ¾ in. Oregon battens, nailed at ½ inch apart, the sharp corners being planed off. The roof light is glazed with ¼ inch mill rolled glass, each opening in two sheets, lapped 3 inch in the centre, and spaced ¾ inch apart to give ventilation. Window sashes are hinged as casements, opening outwards. Doors to catching pens are made of ½ inch pine, hinged to open both ways on spring hinges. Those between the pens are, in some instances, sliding upwards, in others, sliding horizontally. The pens under the floor for shorn sheep, and the counting pens are formed of light batten hurdles, all movable, so that the hurdles are available for other purposes.



Ground Plan of Shearing Shed. Bathurst Experiment Farm. Showing Drafting Yard and Branding Race.

Report of Demonstration Area, Wagga Experiment Farm, 1912.

G. M. McKEOWN, Manager.

In the following statements the rates quoted are the actual district cost as obtained from leading farmers, and should not be confounded with local contract rates, which are considerably higher.

The accounts are charged with full cash value of seed sown, less cost of bags, the actual cost of manure on the Farm, wear and tear of machinery at 2s. 6d. per acre, and rental at 5 per cent. of the capital value of the land (£6 per acre). Credits are given at actual cash prices in case of sales, and at the following valuations for produce consumed on the Farm :—

	£	s.	d.	
Milling quality wheat and barley	0	3	0	per bushel.
1st grade screenings	0	2	9	,,
2nd ,, ...	0	2	0	,,
Hay	3	0	0	per ton.
Straw	1	0	0	per ton in stack.

Paddock No. 8.

27 acres. Wheat, Marshall's No. 3.

Dr. *Cr.*

	s.	d.	£	s.	d.		£	s.	d.
To Seed, 17 bush., ... @	5	6	4	13	6	By 489 bush., or 18 bush. per acre :—			
Manure, 13½ cwt. ... @	4	3	2	17	5				
Ploughing, 27 acres, @	4	3	5	14	9	435 @ 6s., 27 @ 3s., 27 @ 2s. 9d.	138	5	3
Harrowing (twice)... @	1	0	1	7	0				
Drilling ... ... @	1	6	2	0	6				
Harvesting ... ... @	3	0	4	1	0				
Grading, 489 bush.... @	0	2	4	0	9				
Bags 163, and twine @	0	7	4	15	1				
Cartage			4	2	9				
Wear and tear, 27 ac. @	2	6	3	7	6				
Rent of land ... @	6	0	8	2	0				
Balance			93	3	0				
			£138	5	3		£138	5	3

Profit, £93 3s., or £3 9s. per acre.

Note.—Had the whole crop been sold at 3s. 3d. milling rate, instead of at various rates for seed, &c., the net return would have been £38 7s. 9d. or £1 8s. 5d. per acre.

Paddock No. 5.

150 acres.

Wheats :—Federation, 80 acres ; Bunyip, 16 acres ; Firbank, 16 acres.
Barleys :—Gisborne, 10 acres ; Kinver, 10 acres ; Golden Grain, 10 acres ; Skinless, 8 acres.

Dr.	£	s.	d.	*Cr.*	£	s.	d.
To Seed—				By 1,339½ bus. wheat and 88½ bus. barley, or 9½ bus. per acre—			
57 Federation, 12 Firbank, and 9 Bunyip wheats (bus)., @ 5s. 6d.	21	9	0	Federation, 864 @ 6s., 153 @ 3s., 141 @ 2s. 9d. ; Firbank, 100½ @ 6s., 3 @ 3s. 3d., 6 @ 3s., 3 @ 2s 9d. ; Bunyip, 60 @ 6s., 6 @ 3s., 3 @ 2s. 9d. ; Skinless, 6 @ 6s., 6 @ 5s. ; Gisborne, 3 @ 6s., 4 @ 5s., 4 @ 4s. 6d., 5 @ 3s. ; Kinver, 6 @ 6s., 20 @ 5s , 9 @ 4s. 6d. ; Golden Grain, 3 @ 6s., 19 @ 5s., 3½ @ 4s. 6d.	380	12	0
7 Gisborne, 7 Kinver, 7 Golden Grain, and 6 Skinless barleys(bus.), @ 4s. 6d.	6	1	6				
Manure	17	5	7				
Ploughing, 150 acres @ 4s. 3d.	31	17	6				
Harrowing and rolling (twice), @ 1s. 8d.	12	10	0				
Ploughing (second), 150 acres, @ 3s.	22	10	0				
Drilling, @ 1s. 6d.	11	5	0				
Harvesting, @ 3s.	22	10	0				
Wear and tear, @ 2s. 6d.	18	15	0				
Rent, @ 6s.	45	0	0				
Grading 1,339½ bus. wheat, 88½ bus. barley, @ 2d.	11	18	0				
Cartage to rail	6	2	5				
Bags (476) and twine, @ 7d.	13	17	8				
Balance	139	10	4				
	£380	12	0		£380	12	0

Profit, £139 10s. 4d., or 18s. 7d. per acre.

Paddock No. 4.

Dr. 90 acres, Zealand Wheat. *Cr.*

	£	s.	d.		£	s.	d.
To Seed, 54 bus. @ 5s. 6d.	14	17	0	By 1,350 bus., or 15 bus. to acre—			
Manure	14	12	6	12 @ 7s. 6d., 1,182 @ 6s., 93 @ 5s. 6d., 42 @ 3s., 21 @ 2s. 9d.	393	17	3
Ploughing, 90 acres @ 4s. 3d.	19	2	6				
Harrowing and discing, @ 5s.	22	10	0				
Rolling, @ 8d.,	3	0	0				
Drilling, @ 1s. 6d.	6	15	0	Straw, 70 tons @ 20s.	70	0	0
Picking out strangers	14	1	11				
Reaping and binding, @ 1s. 10d.	8	5	0				
Stooking and stacking, @ 6s. 9d.	30	7	6				
Threshing 1,350 bus., @ 3d.	16	17	6				
Grading 1,350 bus., @ 2d.	11	5	0				
Bags (450) and twine, @ 7d.	13	2	6				
Cartage	12	0	0				
Wear and tear, @ 2s. 6d.	11	5	0				
Rent, @ 6s.	27	0	0				
Balance	238	15	10				
	£463	17	3		£463	17	3

Profit, £238 15s. 10d., or £2 13s. 1d. per acre.

NOTE.—If harvested and the grain sold at milling rates (3s. 3d.), the profit would have been £61 13s. 2d., or 13s. 9d. per acre.

Paddock No. 4a.

110 acres, Zealand wheat for Hay.

Dr. *Cr.*

	£	s.	d.		£	s.	d.
To Seed, 72 bus., @ 5s. 6d. ...	19	16	0	By 160 tons hay, @ £3 (valuation)	480	0	0
Manure	19	19	5				
Ploughing 110 acres, @ 4s. 3d.	23	7	6				
Harrowing and discing, @ 5s.	27	10	0				
Rolling, @ 8d.	3	13	4				
Reaping and binding, @ 1s. 10d.	10	1	8				
Stooking and stacking, @ 6s. 9d.	37	2	6				
Wear and tear, @ 2s. 6d. ...	13	15	0				
Rent, @ 6s.	33	0	0				
Balance	291	14	7				
	£480	0	0		£480	0	0

Profit, £291 14s. 7d., or £2 13s. per acre.

DEMONSTRATION AREA—377 acres.

Summary.

Dr. *Cr.*

	£	s.	d.		£	s.	d.
To various charges at average local rates	699	10	9	By 3,178½ bus. wheat @ various rates	891	12	3
Balance...	763	3	9	88½ bus. barley	21	2	3
				160 tons hay, @ £3 ...	480	0	0
				70 tons straw, @ £1 ...	70	0	0
	£1,462	14	6		£1,462	14	6

Profit, £763 3s. 9d., or £2 0s. 6d. per acre.

NOTE.—If the grain from Paddocks Nos. 4, 5, and 8 had been sold at milling rates, the profit would have been £394 2s. 10d., or £1 0s. 11d. per acre.

To Waterproof Canvas.

A CORRESPONDENT from Tamworth recommends both the following recipes for waterproofing canvas. They may be found useful by others:—

1. Dissolve 1 oz. shredded soap in ½ pint of hot water, add to it 7 lb. of paint, apply it to the canvas, and allow to dry thoroughly (two or three days); apply another coat of the same paint, but without the soap, allow it to dry, then give a third coat. When treated thus the canvas will not crack or stick when folded up. This is used in the British Navy.

2. Dissolve ½ lb. of ordinary yellow soap cut in pieces in a quart of boiling water, then stir in a gallon of boiled linseed oil, 6 lb. of yellow ochre, and 3 oz. of terebene; mix thoroughly whilst hot, but allow to cool before using. Two or three coats will be necessary. Dry in a strong draught—not in the sun.

Results of Demonstration Area, Nyngan Farm, 1912.

H. J. KELLY, Manager.

On the Demonstration Area of this Farm 100½ acres of wheat for hay and 2½ acres for grain were sown, resulting in a return of 100 tons of hay, 26 bushels of wheat, and 1 ton of straw. Owing to the fact that agriculture is only carried on in the district on a very small scale, it is not possible to quote local rates for the various operations, as has been done in the reports of Bathurst and Wagga Demonstration Areas. The cost of production given below is therefore that actually paid to the farm employees for their labour, together with an allowance of 2d. per hour for each horse worked. Plant depreciation is charged at 2s. per acre, and in addition the sum of £20, or approximately 4s. per acre, is allowed to cover management and office expenses. A comparison with the local rates at Bathurst, published in our November issue, and at Wagga, given in our current number, will indicate how closely these approximate to accuracy.

The charges for the various operations work out at the following rates, but it should be noted that the land had not previously been ploughed, and therefore the cost of ploughing was somewhat greater than that of working land which has been in cultivation for some years.

Table showing charges for the various operations, less depreciation on horses and plant.

	s.	d.	
Six-inch disc ploughing	6	8	per acre.
Cultivating with disc cultivator	2	1	,,
,, spring-tooth cultivator	1	3	,,
Harrowing	0	8	,,
Rolling	0	10	,,
Drilling	1	8	,,
Cutting with binder	2	0	,,
Stooking	1	8	,,
Carting in and stacking	7	0	,,
Binder twine, at cost	1	6	,,
Seed wheat, @ 6s. per bushel	3	0	,,
Fertiliser, @ £4 10s. per ton	1	6	,,
Rent per annum, @ 5 per cent.	3	0	,,

The hay and straw were taken at average local rates, and sales were made on this basis.

From the returns given it is evident that there are unlimited possibilities for the expansion of agriculture in the Nyngan district, as a return of 16s. 4d. per acre, after covering all charges for rent, labour, seed, manure, and depreciation, is extremely satisfactory.

The financial statement for the 103 acres, based upon these costs, is therefore as follows:—

Dr.	£	s.	d.	*Cr.*	£	s.	d.
Six-inch ploughing	34	3	10	Wheat, 26 bushels @ 6s. ...	7	16	0
Cultivating, disc (once)... ...	10	11	3	Hay, 100 tons @ £3	300	0	0
,, spring-tooth (twice)	12	13	4	Straw, 1 ton @ £2	2	0	0
Harrowing (twice)	6	8	7				
Rolling (once)	4	5	9				
Chipping weeds (hoe)	1	15	6				
Planting wheat	8	8	9				
Seed wheat (treated)	15	9	0				
Fertiliser	7	10	6				
Cutting with binder	10	7	6				
Binder twine	7	15	7				
Stooking	8	13	5				
Carting in and stacking ...	35	7	1				
Threshing (total cost)	1	15	0				
Thatching stacks	6	16	9				
Rent for eighteen months ...	23	3	6				
Plant depreciation	10	6	0				
Management and office expenses	20	0	0				
Balance	84	3	9				
	£309	16	0		£309	16	0

Profit, 16s. 4d. per acre.

Guernsey Cattle.

Reduced Prices for Bulls to New South Wales Dairy Farmers.

Owing to the extremely heavy demand for the leasing of Guernsey bulls, the Minister for Agriculture has under consideration the question as to whether the sale prices of young Guernsey bulls bred by the Department should not be reduced, with the object of encouraging the farmers to purchase young bulls rather than to extend the leasing system.

The leasing system was introduced for educational purposes, in order to demonstrate the value of pure-bred bulls of good strains, but this purpose has been served to a great extent, and hence arises the question of sale *versus* leasing. The leasing system could possibly be extended to meet requirements, but the Department finds that there are too many farmers who do not take the necessary care of the bulls which they lease, and consequently a number of these animals have been returned in anything but the best condition after leasing.

After due consideration the Minister has decided to considerably reduce the sale price of young Guernsey bulls to farmers in this State, and instead of charging from £40 to £45 for yearlings, the price of good yearling Guernsey bulls will not be more than 30 guineas. A number are advertised in this issue at these rates.

Maize Variety Trial, 1912.

Wollongbar Experiment Farm.

J. G. McMILLAN, Manager.

The Experiments Supervision Committee, under whose control these experiments are being conducted, wish to draw the attention of farmers to the fact that final conclusions cannot be drawn from these trials, as they have only been conducted for a few years. Later, when further results are available, a summary will be prepared, as sufficient evidence will be on hand to enable conclusions to be formed. Meanwhile, it is felt that the public are entitled to know the results obtained each year.

The object of the experiment was to ascertain the most suitable variety for grain. The ground was previously planted with wheat and other cereals. A mixture of two parts superphosphate and one part sulphate of ammonia was applied at the rate of 56 lb. per acre. The ground had previously been manured with 84 lb. fertiliser per acre, *i.e.*, in the beginning of May, when the winter fodder crop was sown. The maize was sown in October, 1912.

The varieties were Yellow Dent (check), Hickory King, Early Yellow Dent, Funk's Yellow Dent, Red Hogan, Boone County Special, Riley's Favourite, Horse Tooth, and Early Leaming.

All the seed germinated in seven days.

Four weeks after sowing the crop was scuffled with the Planet Junior.

In seven weeks after sowing it was cultivated with the Disc Cultivator; and in nine weeks after sowing it was cultivated with the Planet Junior.

The growth was rapid throughout. The weed known as "Stinking Roger," and also summer grass made considerable growth.

There were thirteen plots in all, of four drills each. The drills were 11·5 chains long and 3 feet 9 inches apart, making a total area of 2·61 square chains, or ·26 of an acre. Pulling was commenced on 10th April, and completed on the 18th, wet weather having intervened, causing considerable delay.

The results were as follow, the whole of the four rows in each plot being weighed.

TABLE SHOWING RESULTS OF VARIETY TRIAL.

No.	Variety.	Bushels per Acre	Remarks.
1	Yellow Dent (check)...	43·2	Very nice sample, free from grubs and weevils.
2	Hickory King... ...	38·46	,, ,, ,,
3	Early Yellow Dent ...	35·35	Affected slightly with grubs and weevils, not a nice grain.
4	Yellow Dent (check) ...	44·0	Very nice sample, free from pests.
5	Funk's Yellow Dent ...	39·28	Affected considerably by weevil, not a good appearance.
6	Red Hogan	45·53	An excellent corn, free from all pests.
7	Yellow Dent (check) ...	35·5	Very nice sample, free from pests.
8	Boone County Special	43·3	Heavy yield, but an inferior sample.
9	Riley's Favourite ...	45·0	,, but only a moderate sample
10	Yellow Dent (check) ...	38·75	Same remarks as No. 1.
11	Early Leaming ...	58·64	A splendid sample, surpassing all others.
12	Large Horse-tooth ...	30·75	A good sample, but low yield.
13	Yellow Dent (check)...	41·6	Same remarks as in No. 1.

It will be noticed that check plot No. 7 gave a much lower yield than any of the other Yellow Dent plots. There seemed to be no reason for this discrepancy.

It is evident from the foregoing table that the most suitable varieties for the district are Yellow Dent, Hickory King, Red Hogan and Early Leaming. The yields this year have surpassed anything previously attempted with maize at Wollongbar. Last year the test was made in the same paddock, but no manure was used.

The climatic conditions being much the same each year during November and December, evidently the application of manures gave the good results stated.

The cost of the manure was 5s. 3d. per acre.

SMUT IN OATS.

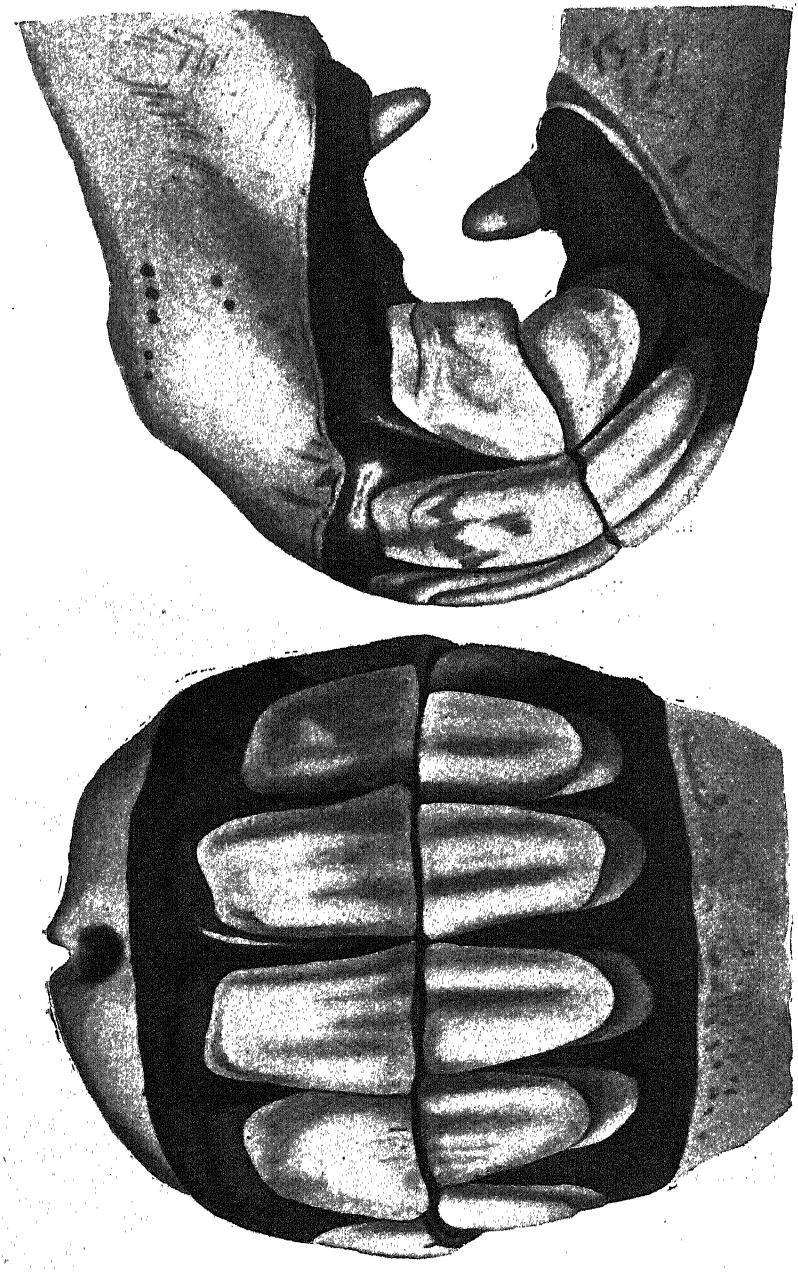
A CORRESPONDENT at Yass asks for details of the best treatment for oats affected by smut. One paddock of oats had a lot of smut in it last year, and it was cut for hay. Fresh clean seed was purchased this year, but the crop had more smut in it than ever, nearly a quarter being affected.

In reply, Mr. H. Ross, Chief Inspector, stated that to guard against smut in oats the seed should be treated similarly to wheat, that is to say, prior to sowing it should be dipped in a solution of bluestone (1½ lb. to 10 gallons of water). If sown within a day or two of dipping, and if there is a prospect of immediate germination, no further action is necessary; if, however, the weather is dry and the oats are liable to be in the ground several weeks before germinating, it is advisable to dip the seed after they come out of the bluestone into a solution of lime water, which is made by stirring 1 lb. of lime into 10 gallons of water.

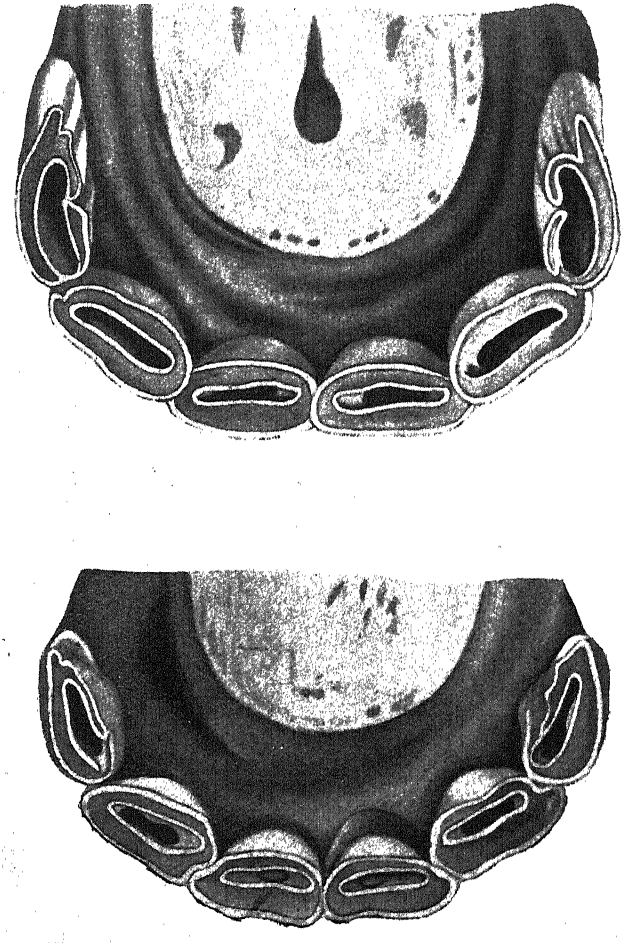
The Teeth of the Horse and its Age.

[Continued from page 987.]

Compiled by the Veterinary Officers of the Stock Branch.



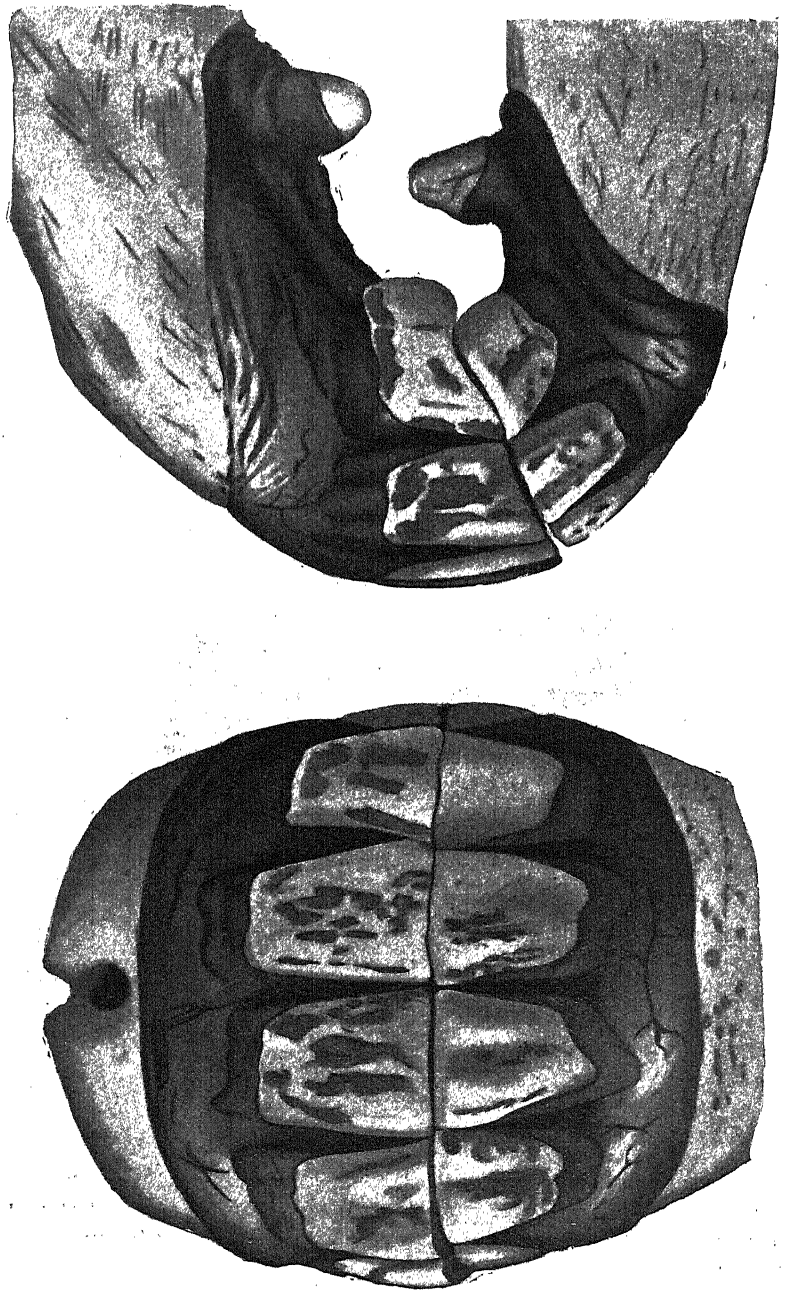
SIX YEARS.



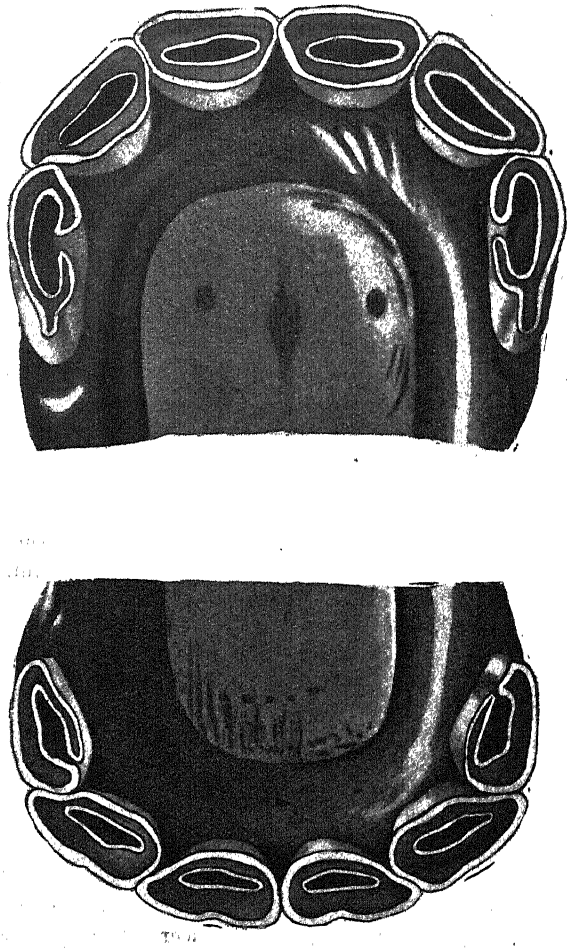
MOUTH AT SIX YEARS.

[*After Goubaux and Barrier.*]

At 6 years: the inner edge of the corner incisors is worn level with the outer edge. The tables of the lower central incisors at this age are, as a rule, worn level; the dental cavity having disappeared out of them. The central incisors viewed from the front are slightly whiter than at 5 years old on account of their beginning to lose their coat of cement.



SEVEN YEARS.



MOUTH AT SEVEN YEARS.

[*After Goubaux and Barrier.*]

At 7 years : the posterior edge of the lower corner incisor is usually well in advance of that in the upper jaw. The dental cavity has now disappeared out of the lateral incisors, but it still remains in the corner incisor teeth.

(*To be continued.*)

Strangles and Influenza.

C. J. SANDERSON, M.R.C.V.S., Government Veterinary Surgeon.

STRANGLES.

STRANGLES is an infectious disease of the horse, mule, and ass. It is seen usually in young animals that have been brought into stables for the first time, but may occur in those running at grass also. After recovery the animal is immune to the disease, and this immunity is usually life-long.

The cause of strangles is infection from an animal suffering from the disease, or indirectly through contact with the discharges from those affected. All the morbid discharges are contagious. A predisposition to contract strangles might be caused by a common cold, which prepares the tissues for the reception of the micro-organisms.

Livery stables, where many horses of all ages are stabled, are ideal places for spreading the disease.

Symptoms.

Very often the first sympton noticed is a swelling between the branches of the lower jaw; but, as a rule, the animal is noticed to be dull and off feed for a day or two before active symptoms develop. Then a hard, dry cough is heard, followed by a running from the nostrils, which is at first watery, but soon develops into a thick, slimy discharge, with purulent matter mixed with it. As the disease progresses the coat stares, the mucous membrane of the eye, if examined, will be found to be red, the temperature rises, and the pulse is quickened. Usually the breathing is slightly accelerated, due to the blocking of the air passages with mucous. The swelling below the jaw becomes hot, tender, and may break and discharge a thick, yellowish pus. This hot, painful swelling is usually considered the most characteristic symptom of strangles. After the abscesses break or are lanced, and the nasal discharge becomes well established, the fever abates and the appetite returns. This is followed by a progressive decrease of the nasal discharge, and at the end of ten days or a fortnight the animal is well.

The foregoing is the usual course of events in strangles, but the disease may assume a malignant form, or complications may arise which may prove fatal. The swelling below the jaw may become excessive, extending down the throat and up as high as the ears. Abscesses may form in any part of the body, including the lungs, brain, and abdominal cavity. In the latter case the animal shows symptoms of colic, while, if the lungs become affected and full of discharge, the breathing will become laboured, the flanks heave, and great distress will be shown. A common symptom is inflammation of the larynx. When this occurs swallowing is impeded, and fluids are returned through the nostrils.

Another complication appears in an inflammation of the skin of the head, when small abscesses appear on the lips, cheeks, nostrils, and other head parts, accompanied by a more or less severe swelling of the affected parts.

Pneumonia may also occur from food finding its way down the windpipe owing to the difficulty in swallowing, due to the swollen condition of the throat.

The disease may become chronic, in which case the nasal symptoms do not completely disappear. The above are the principal complications.

Treatment.

Isolate the animal, and use separate buckets to feed and water it. Treatment is simple, and aims at the prevention of complications which may prove fatal. Keep the patient warm and well covered. This will assist in the prevention of pneumonia and bronchitis. Steam the head three or four times a day with the vapour of hot water, in which a little oil of eucalyptus has been placed. This will allay the inflammation of the mucous membranes, ease the cough, and promote discharge from the nostrils. Do not place the head in a bag to steam it, but hold it close down over the bucket. It is a good plan to keep a sick horse in the paddock, where is usually holds its nose to the ground and freely discharges the morbid matter. Treatment of the swellings between the jaws is of the greatest importance. Keep hot linseed meal poultices on continually, and as soon as the abscess softens it should be opened at its lowest point. If abscesses do not come to a head quickly, they should be rubbed with thick mustard and water, particularly at their lowest point, in order to induce them to do so. If the pus is not let out, it will burrow in the tissues under the skin, and often result fatally. After the abscess has burst or been opened, the treatment to be followed consists in dilating the opening to give free discharge to the pus, and in washing out the abscess cavity with warm water, to which a little lysol has been added. A teaspoonful of lysol to a pint of water will be sufficient.

In severe cases, where there is acute laryngitis, shown by difficulty in swallowing and return of fluids by the nostrils, when a distressing cough is present, and a loud noise produced during inspiration, a smart mustard blister should be applied to the region of the throat. This usually gives speedy relief, and is better than poultices. Feed on warm mashes, steamed hay, and generally tempt the appetite, as if food is refused there is great danger and difficulty in forcing nourishment on a horse with strangles.

Green food, when obtainable, is recommended.

The administration of drenches is impossible in many cases in consequence of the sore throat. It is better to give medicine in the food or water, or by placing it on the back of the tongue with a smooth stick.

The following is good to allay irritation of the throat:—

Extract of belladonna, 1 ounce.
Chlorate of potash, 2 ounces.
Boracic acid, powdered, 1 ounce.
Glycerine, 2 ounces.
Honey or treacle to make 8 ounces.

Dose.—Give two tablespoonfuls on the back of the tongue three or four times a day.

Two ounces of Epsom salts in the drinking water three times a day is good to reduce fever.

Chlorate of potash given twice a day in dessert-spoonful doses in the drinking water is also a good treatment.

Prevention.

The micro-organism which causes strangles seems to be able to live outside the animal's body for a very long time, and thence to infect susceptible horses. It is therefore necessary, in order to prevent future cases, to thoroughly disinfect the stables used by animals suffering from this disease. Scrub the buckets, manger, and woodwork of the stalls with boiling water, to which some reliable disinfectant has been added. Sprinkle lime on the floors and limewash the walls.

Influenza.

Influenza is a disease that can well be dealt with in considering strangles, because of a certain resemblance in the symptoms of the two diseases.

Influenza of the horse is an acute infectious disease, the most characteristic symptoms of which are a rise of temperature and a catarrhal condition of the mucous membranes usually of the head, though the bowels may be implicated as is shown by diarrhœa of a more or less severe nature. It usually attacks a large number of horses at one time, spreading from horse to horse with great rapidity. The disease is not of a particularly fatal character though individual outbreaks have shown a mortality as high as 10 per cent. With common-sense treatment the mortality should not exceed 3 per cent. The disease usually lasts about ten days, though severe cases may run for two or even three weeks. As showing the virulence of the virus of influenza, stallions have been known to transmit the disease to mares they have served months after apparent recovery. The virus appears to be carried on the clothes of human beings, in harness, and in stable litter. After exposure to infection the horse usually develops the disease in from two to seven days.

Symptoms.

The disease appears suddenly, a horse that may have been well overnight being found ill in the morning. There is always great depression shown by hanging of the head and refusal to eat. The horse appears stupid and sleepy and will not move. If forced to do so the muscles of the shoulders are seen to tremble and the hind quarters often sway from side to side. In some cases the hind legs may completely give way while walking. By using the clinical thermometer the temperature is found to be raised to 104° Fah. or even higher. The surface of the body shows patches of cold skin alternated with patches of skin where the temperature is raised.

The mucous membrane of the month is hot and dry or covered with mucus. The animal frequently yawns and often has difficulty in swallowing. At first there is constipation, the fæces being covered with slime, and later diarrhœa, with considerable straining, occurs. The horse shows tears flowing from the eyes, and the eyelids swell, are hot, painful, and kept more or less continuously closed. As the disease progresses the limbs, sheath, and lower part of the chest swell.

There is a thick discharge from the nose and a cough. During the course of the disease the animal wastes rapidly, while mares often abort.

As will be seen, many of the symptoms are identical with those of strangles. The points of difference are the sudden onset of the disease in influenza, and the fact that in strangles abscesses almost invariably develop between the branches of the lower jaw, which is not the case in influenza. Again, in strangles there is not the marked depression usually found in influenza.

While influenza is not an especially dangerous disease, yet many complications occur which may render it both fatal to the horse and expensive to horse-owners.

Such troubles as pneumonia and heart and kidney complications often cause death, while lameness in connection with joints and tendons, laminitis (fever in the feet), roaring and whistling often follow an attack and decrease the value of the horse considerably.

Treatment.

The first consideration is to cease working the horse and not to work the animal again till he has completely recovered, which will take place in from two to three weeks.

In many cases keeping the animal warm and dry, feeding on greenstuff, and keeping a plentiful supply of pure, cold water in front of him is all the treatment necessary. When sore throat exists treat as recommended for strangles, and also give inhalations of steam with oil of eucalyptus added.

When there is great pain and stiffness in the limbs give, three times a day, salicylate of soda in half-ounce doses mixed with honey and smeared on the tongue. Usually in influenza it is inadvisable to drench owing to the danger of the drench going down the windpipe by reason of the sore throat.

If constipation be present, give small doses of Epsom salts in the drinking water. About three ounce packets during the day are sufficient. Feed on bran mashes also.

Where debility is very pronounced, quarter-pint doses of whisky well diluted and carefully administered three times a day are good and stimulate the appetite. When diarrhœa is present it should not be checked too

quickly. If, however, it persists give a few doses of the following mixture three times a day:—

Chlorodyne, half an ounce.
Prepared chalk, half an ounce.
Powdered catechu, 2 drachms.
Water to one pint.

It is best to bathe the eyes twice daily with some boric lotion, and if the horse is in the open a shade should be used to protect the eyes from the light. To tempt the animal to eat, give milk, oatmeal gruel, linseed tea, bran mashes, scalded oats, &c. Care and nursing are of more importance than drugs in this disease. In cases where complications occur the services of a skilled veterinarian should be obtained if possible.

After the temperature falls, to promote a speedy return to health it is advisable to give a course of tonic medicine. Give one of the following powders in the feed twice a day:—

Sulphate of iron, 2 drachms.
Powdered nux vomica, 20 grains.
Powdered gentian, 2 drachms.
Powdered fenugreek, half an ounce.

A Ration for a Draught Stallion.

The Stock Branch has been asked what is the best feed to give a draught stallion during the season, when serving about fifty mares, how much green feed to give, and what is the best chaff during the season—wheaten, oaten, or lucerne.

In reply it was stated that the best feed for the purpose would be—

Oaten chaff	18 lb.
Oats	12 lb.
Maize	4 lb.
Beans	3 lb.
Salt	1 oz.

This should be divided into four feeds, the largest to be given at night after the day's travelling is done.

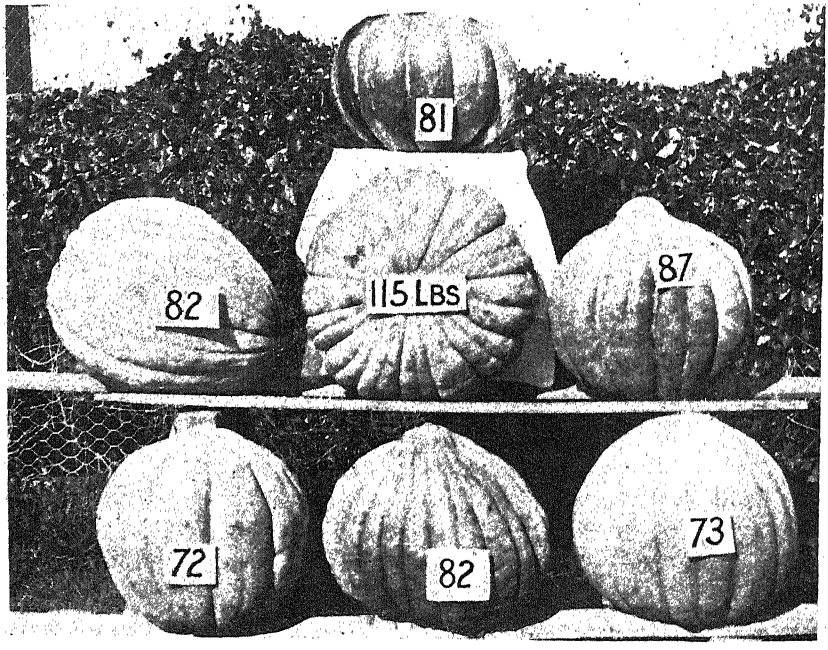
Barley, oats, and lucerne, as greenstuff, are all good, but lucerne has the greatest feeding value. If any considerable quantity of greenstuff be given, the ration should be reduced, more especially in the case of lucerne, owing to its high nitrogenous content. Roughly, 1 lb. of the dry feed mixture should be deducted for every 2 lb. of green feed given, but the latter should not be allowed to replace more than one-third of the ration.

Of the three chaffs mentioned, oaten chaff is the best, and wheaten is the worst.

Cattle Pumpkins at Grafton.

Mr. R. C. Anderson, of Jessfield, Carr's Creek, Grafton, forwards a photo of some excellent cattle pumpkins, which we here illustrate. They were planted with maize, and eight two-horse loads were taken off 4 acres. The cultivation was the same as for maize, the land being scuffled with a two-horse cultivator, and then hilled with a disc-hiller. No manure of any kind was used.

Mr. Anderson does not know the name of the variety, but it has taken him eight years to get the pumpkins to their present size and weight He only plants the seeds of the largest and heaviest pumpkins, and it is only this year that he noticed that those which had been picked for seed had not half the quantity of seed they have had in other years.



Eggs in Water-glass.

A correspondent asks if eggs preserved in silicate of soda will keep nine or ten days after they are taken from the solution. In reply, the Poultry Expert states that they will keep for the time mentioned, but will be naturally inferior to those freshly removed from the water-glass.

The Prickly Pears of Interest to Australians.

J. H. MAIDEN,
Government Botanist, and Director of the Botanic Gardens, Sydney.

No. 9.—Dillenius' Prickly Pear (*Opuntia Dillenii*, Haw.).

Description.—It was originally described by Haworth in his "Supplementum Plantarum Succulentarum" at page 79, published in the year 1819.

Then we have—

O. Dillenii (Haw. *Suppl.*, p. 79).—Plant erect; joints roundish-obovate, undulated, glaucous; prickles strong, divaricated, yellow; but the brush-like bristles by which they are surrounded are much shorter. Native of South America.—Dill. *Elth.*, f. 382. *Cactus Dillenii*, Ker., *Bot. Reg.*, 255.

Flowers large, pale yellow; ovarium shorter than the corolla, furnished at the summit by fascicles of bristles.

Dillenius' Indian Fig.—Cultivated since 1810 in England. Shrub of 3 to 5 feet. (*Don, Gen. Dist. Dichlamyd. Plants*, iii, 173.)

It is admirably figured in Wight's *Illustrations of Indian Botany*, ii, 114, also in *Botanical Register*, iii, t. 255. There are also two moderately good eighteenth-century figures of it, viz., Dillenius' "Plantarum rariorum Horti Elthamensis," pl. 396, fig. 382 (labelled "Tuna major, spinis validis flavicantibus, flore sulphureo"), and A. P. De Candolle's "Plantarum Succulentarum (Plantes Grasses)," ii, plate 137, as *Cactus cochinellifer*.

I made the following notes in front of a specimen in the Sydney Botanic Gardens, No. 48.

Lemon or greenish-yellow flowers in profusion; green colour of the conoid portion of the unexpanded imbricated petals; joints large, concave.

Ring of glochidia at base of each flower, base of each articulation, and base (areola) at each cluster of spines. Such glochidia are yellow when young, and turn black with age. They are long and stiff-bristly.

The spines are yellow, large, and in bundles of 3-5. They retain their yellow colour for a long time, and contrast with the black colour of the glochidia.

Flowers borne on edge of joints, as a rule.

It is a rather dwarf species, of scrambling habit, and by reason of its powerful spines, and its especially stout black cushions of spinules, it is perhaps the most formidable looking of all species acclimatised in the Commonwealth. Fortunately, however (Gayndah is an exception), it has not exhibited aggressiveness at all comparable to that of the Pest pear. At the same time, I recommend that no efforts be relaxed to cope with it.

Synonyms.—It is the *Opuntia Tuna* of some Queensland writers, but not of New South Wales legislation, which is *O. nigricans*. It is the *O. Tuna* of Schumann, and the *Cactus cochinellifer* of A. P. De Candolle.

Habitat.—Coasts of Florida, United States of America, Bermuda, West Indies and Vera Cruz, Mexico.

In Sicily, *O. Dillenii*, Haw., is very different from the two others (*O. ficus indica* and *O. amyclea*). It is still more spiny, dwarfer, and more branched.

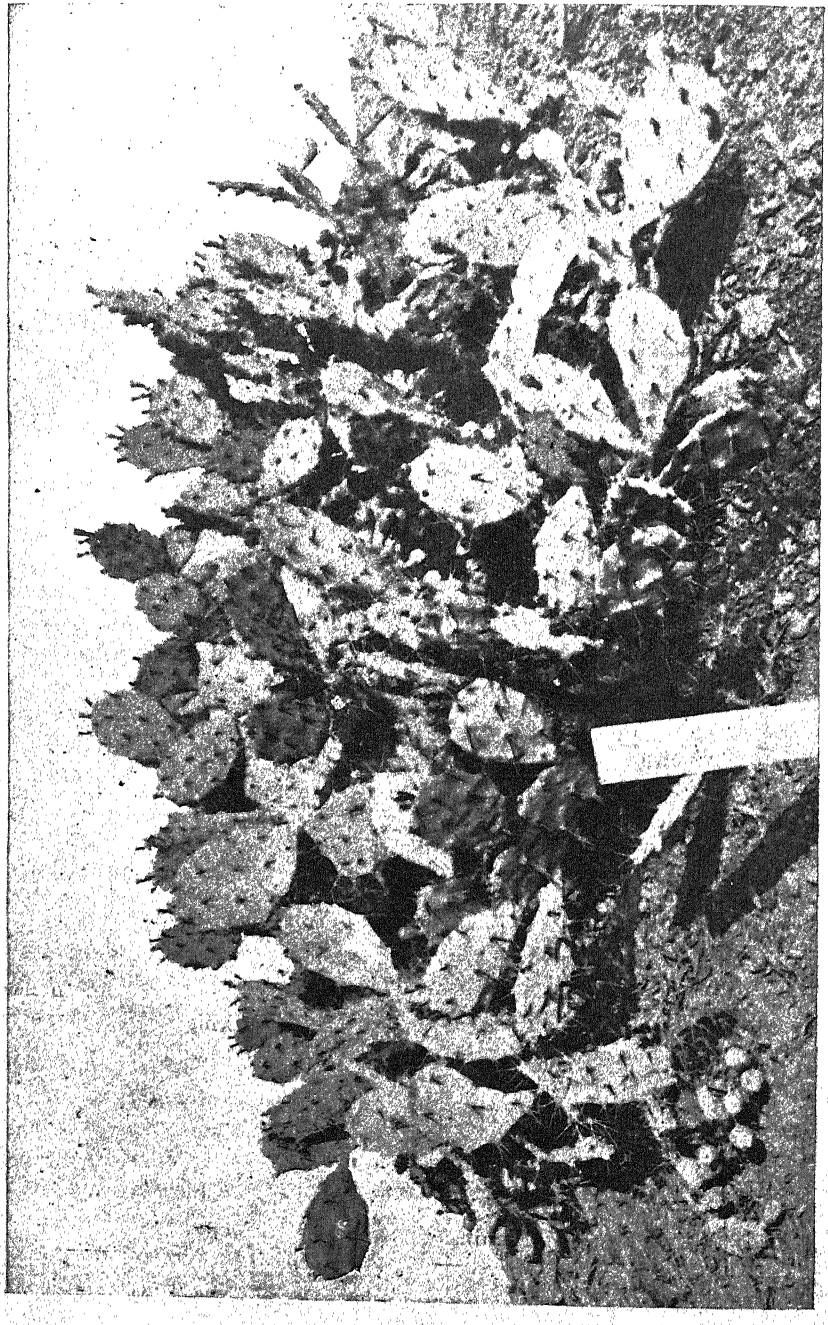


Fig. 1.—*Opuntia Dillenii*' A cultivated plant at the Botanic Gardens, Sydney.



Fig. 2.—*Opuntia Dillenii.* As a pest in the Gayndah District, Queensland. Note the formidableness of the spines.

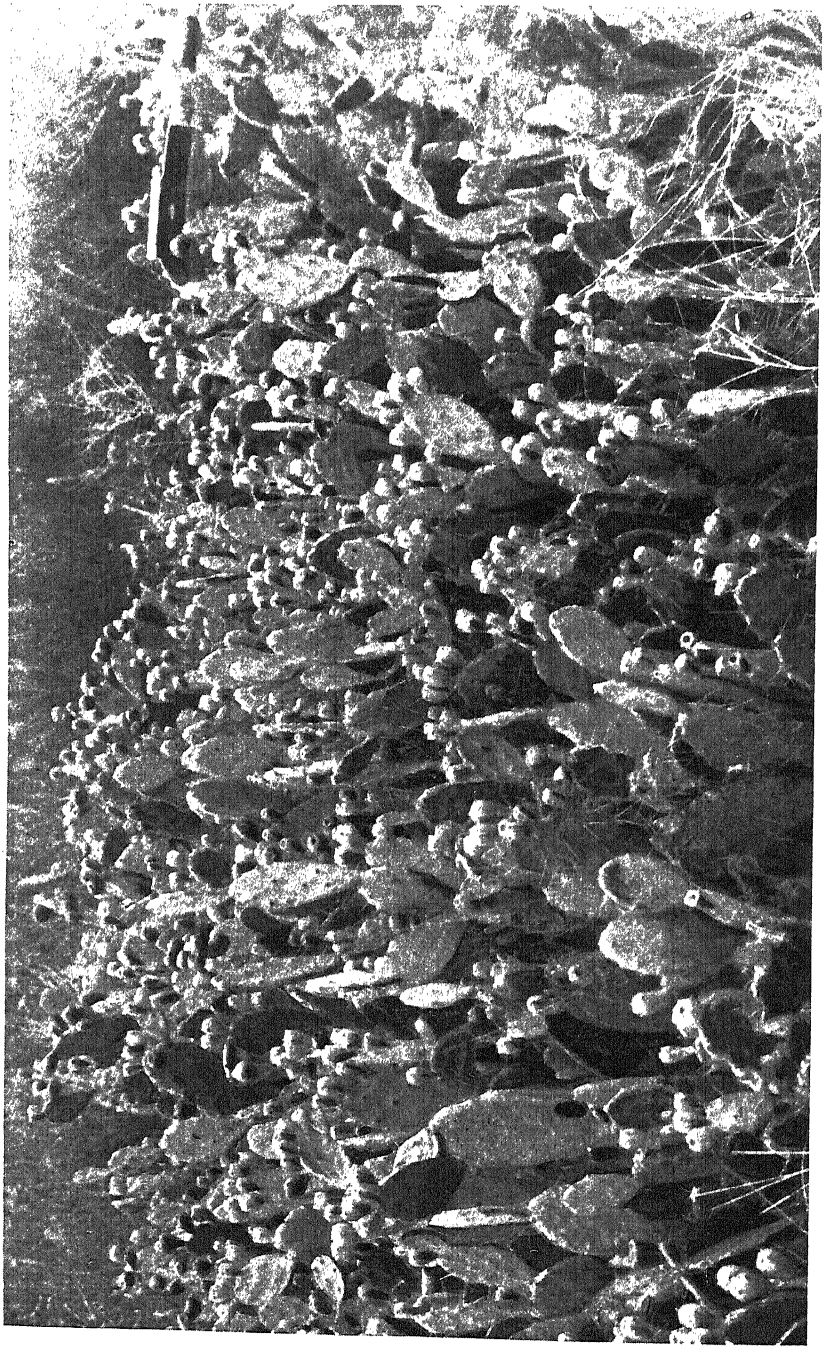


Fig. 3.—*Opuntia Dillenii.* Gayndah, Queensland. Note the denseness of growth and the abundance of fruit.

The fruits are blood-red (used now and then for dyeing), and have so many seeds that there is little room for flesh and juice; they are called "wild" Indian figs, and are eaten only by the poorest. They make good hedges when grown *on the top of walls*; such walls are unsurmountable. This is frequently the habit in Catania. Of all the three species it is the most sensitive to frost; it cannot stand any low temperature, and is therefore grown chiefly near the coast. About 600-700 feet (200 metres) is the highest altitude it can stand in Sicily.

Near Bagheria and Cefala, in Sicily, *O. Dillenii* is planted as *protection against drift sand.* They have been able, near Palermo, to train tomatoes on the shifting sand of the dunes by hedging in squares with Opuntia hedges and planting the squares with tomatoes.—(C. Sprenger, in *Tropenpflanzer*, 1901.)

In India.—It is well established in India, and Burkill speaks of it as the common cactus of the south of India, where it often makes great thickets around villages; it is less common in the north of India. He speaks of it as occurring all along the east coast (of Madras), often within reach of salt-spray.

In Australia.—So far as I know, the only State in which it occurs abundantly is Queensland. Its prevalence about Gayndah is shown in the photographs. It is also plentiful in the Rockhampton district, and less common about Brisbane.

I have never heard of its occurrence in New South Wales.

Mueller (*Key to Syst. of Vict. Plants,* i, 533) records *O. Dillenii* as the only prickly-pear acclimatised in Victoria, but this is a slip of the pen for *O. monacantha.*

I have seen a little of it at Dutton Bay, South Australia.

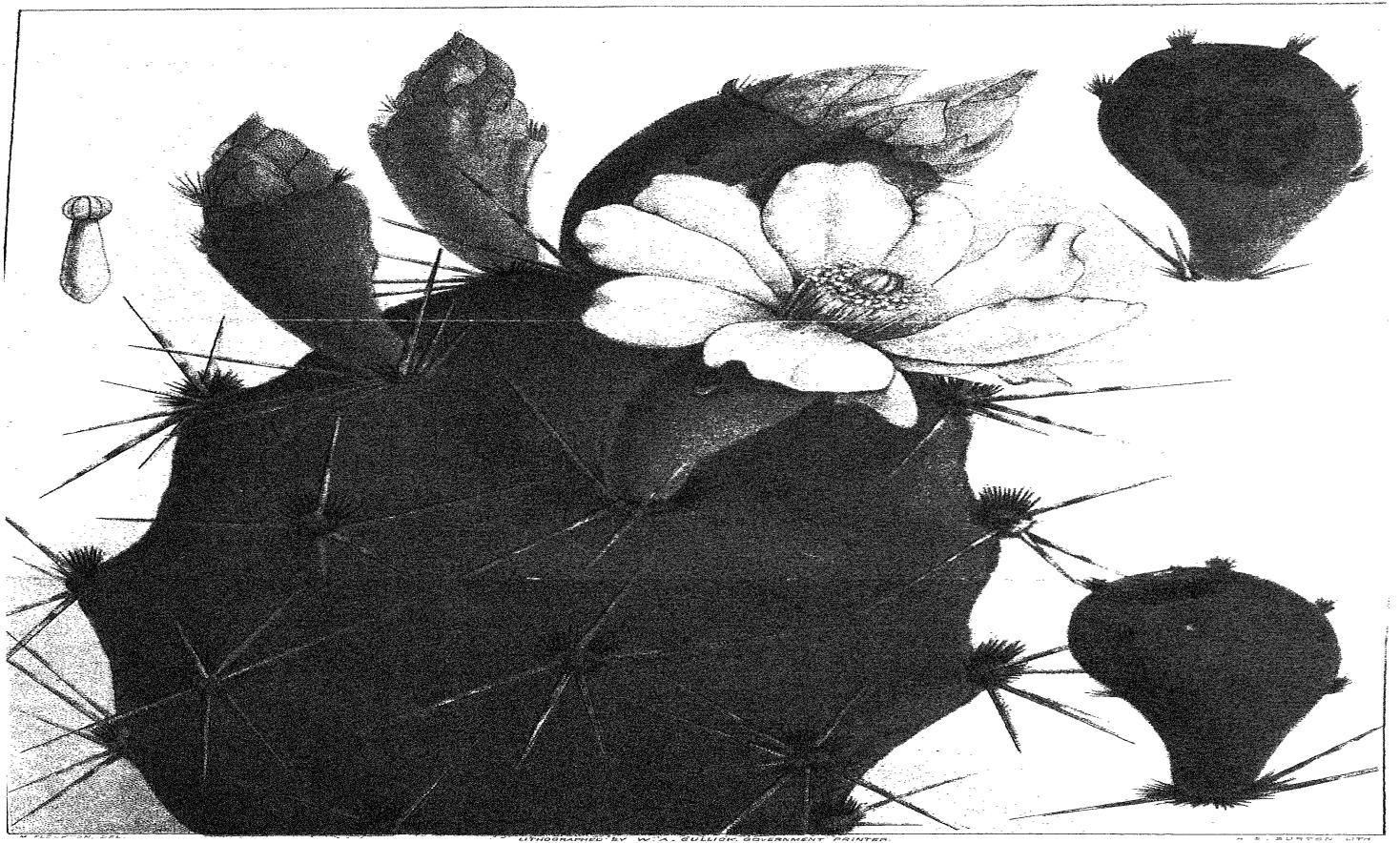
Uses.—It is not easy to quote uses for a plant like this, and the following is all I can find under this category:—

Opuntia Dillenii, Haw. (*Cactus Dillenii*, Ker., in *Bot. Reg.*, iii, t. 255).—A very spiny plant, with a sulphur-yellow flower, slightly streaked on the outside with red, and a purplish, pear-shaped fruit; is generally supposed to be the common prickly-pear of India. The very slender* spines of this plant are used generally in the Canaries for affixing the rags impregnated with the young insect brood to the plants of the true *O. tuna.*

Lowe states that the fruit of *O. Dillenii* is scarcely eaten. This species approaches nearest to *O. nigricans*, Haw. (*Bot. Mag.*, t. 1557), which, however, has dark-brown or black spines. Again, the flowers of this latter are of a yellowish colour, tinged with red, while the fruit is wholly red.—(*Kew Bulletin*, 1888, 169.)

A coarse kind of fibre has been prepared from this species, which has been looked upon as a suitable material for paper-making, but the experts of the Colonial and Indian Exhibition showed that it was useless for the purpose. (See *Dict. Econ. Prod. of India,* in which are also notes in regard to the medicinal properties of this species, no doubt shared by other species.) The statements in this respect are made by duly qualified medical practitioners. The fruit is eaten by human beings in India in times of scarcity. The plant is used for hedges in many parts of India, and in former times was planted as a protection against the attacks of enemies.

* The spines in the cultivated species in Hort. Syd. are by no means slender, and they certainly are not slender in the figure in *Bot. Reg.* or Wight's *Illust Ind. Bot.* The spines, however, vary in their degrees of stoutness.



LITHOGRAPHED BY W. A. GULLICK, GOVERNMENT PRINTER.

OPUNTIA DILLENII, HAW.

"This species has been used as a nurse-plant in India for seedlings of forest trees, but only with limited success." For an account of the utilisation of *O. Dillenii* as a food-plant for the cochineal insect see *Dict. Econ. Prod., India,* ii, 398-405.

DESCRIPTION OF ILLUSTRATIONS.

1. A cultivated plant, Botanic Gardens, Sydney.
2. As a pest in the Gayndah district, Queensland. Note its formidableness.
3. Gayndah. Note its denseness and the abundance of its fruit. Nos. 2 and 3 from Mr. A. Temple Clerk.

Ironbark Foliage Destroyed by Insects.

The ironbark leaves submitted from Stroud were affected by "Lerp Insects" (*Psyllidæ*), aphis-like insects which attack Eucalyptus trees, suck up the sap, and construct delicate shell-like coverings called "Lerps," under which they grow, moult several times, and then appear as minute four-winged insects, which lay the eggs noticed on the leaves, from which fresh broods soon hatch.

Though when plentiful they destroy the bulk of the foliage, it is generally not more than a temporary damage of the trees during the season of their prevalence. They have been recorded as attacking eucalypts similarly in both the Armidale and Bathurst districts some years ago.

It is obviously impracticable to spray whole forests for this pest, but, as a rule, their natural parasites (minute chalcid wasps which develop in the Lerp insects as internal parasites, and make their way out as adults by minute circular holes they form on leaving their hosts), act as a check on the unlimited increase of this pest, and it appears in diminished numbers the following season.—W. B. Gurney.

The Use of Malting Barley for Hay.

A correspondent at Tamworth who had cut a few acres of malting barley for hay just as it was commencing to ripen, the grain and beard being well formed, and had been told that the beard would not be cut up by the chaff-cutter, and when fed to horses was liable to choke them, asked the Department if this was correct.

In reply, the Acting Under Secretary and Director of Agriculture stated that barley of the class referred to should be cut well on the green side, as if allowed to ripen the awns, when fed to horses, would cause irritation and consequent trouble. Under the circumstances the only safe method would be to thoroughly steam the chaff in order to soften the awns before use.

The Transplanting and Cultivation of Native Plants.

EXCEPT a few from the extreme coastal outline, practically all the native species found in the county of Cumberland and south from the same will succeed under Blue Mountain conditions.

1. Leptomeria acida, R.Br. "Native Currant."

If young plants can be obtained, they might be removed in the manner recommended in the article referred to below; the best plan, however, doubtless being to obtain seed and sow in ordinary garden flower-pots.

Leptomeria, like *Exocarpus* (Native Cherry), belongs to the *Santalaceæ,* which are root-parasitic, and no horticulturist can yet guarantee successful transplanting, even when we transplant pieces of the root of the host on which it was parasitic. Seedlings of this class, as a very general rule, fail when they are a few inches high. If I heard of a successful transplant a year old I would go a hundred miles to see it.

If it is intended to devote a section of ground to the cultivation of native plants, then, in the first place, it would be necessary to clear a piece of ground, say, about 50 feet square. Grub out with mattock and spade all the stumps, roots, and large pieces of rock, &c., during which process turn over the soil to about 15 to 18 inches deep, afterwards roughly level down, and allow it to lie for a time to consolidate; if of a sandy nature, and it is required to plant at once, if a roller happens to be handy give it a good rolling, for the reason that native species generally prefer a fairly firm soil. If they can be obtained, the plants might then be carefully removed from their natural habitat, and replanted in the prepared section, in rows 5 feet apart, and the same between the plants.

2. Telopea speciosissima, R.Br. "Waratah."

To a great extent the remarks for the "Native Currant" will apply to the "Waratah." After the preparation of the ground, say, as an oval bed 18 feet wide and 25 feet long, such a bed would take two rows right round, about twenty plants in all. If nice young healthy plants could be obtained, taking them up with large balls of earth attached so as not to unduly disturb the roots, there is every reason to conclude that the experiment would be successful. Mulch well with rotted cow manure. It is a great mistake to suppose that native plants like poor treatment.

3. Ceratopetalum gummiferum, Sm. "Christmas Bush."

For the embellishment of the pleasure garden, the most suitable method is to plant either as single specimens or in clumps of from three to five

plants. This is a species which lends itself to culture more than most indigenous subjects. The plants in this case are usually obtained from seed, which is best secured from plants growing in the bush, as soon as ripe and sown immediately, this being a seed which will not preserve its vitality for any great length of time. About the end of January it might be so obtained.

When preparing the ground for this species a moderate amount of thoroughly decayed manure or leaf mould may be dug in, mixing up well with the soil.

In regard to all the above, when the planting has been effected attention must be given to watering.

The winter months are usually to be preferred for lifting and planting—that is to say, any time after the month of May up to August or even September.

The soil should never be disturbed more than is necessary near to the plants; just round the plants the harder and more intact it can be maintained the better.

General directions in regard to culture, &c., may be found in an article, "Cultivation of Native Flowering Plants," in the *Agricultural Gazette* for 1904, page 65, by Mr. J. H. Camfield, reproduced in the New South Wales *Public Instruction Gazette* for 30th June, 1913, page 168.—J. H. Maiden.

A Recipe for Cherry Wine.

Remove the stalks of the cherries and then make a pulp of the fruit without breaking the stones, working the pulp so as to free it entirely from the stones. The pulp should then be passed through a sieve. To the pulp of every 25 lb. of fruit add 5 lb. of sugar, together with 5 oz. of cream of tartar and one gallon of water. Stir the whole and make a homogeneous fluid. Place the vessel in a room where the temperature is from 65 to 70 degrees Fah., and cover same with a cloth. After about twenty-four hours the liquid will begin to ferment. When fermentation has subsided (which can be judged by the cessation of bubbling) the liquid should be separated from the pulp, and the former (which is now wine) is stored away in a cask and kept in a cool place. The storage vessel should be kept filled, either by adding more of the cherry wine or else good sound grape wine, red or white. The tub in which the cherry juice is placed to ferment, and the vessel in which the cherry wine is afterwards stored, should be very clean. A good way to clean them is to wash them once or twice with water in which washing soda has been dissolved in the proportion of 1 lb. of the latter to 2 gallons of water. The vessels are washed again with water, to a gallon of which a wineglassful of sulphuric acid has been added. All vessels should then be rinsed two or three times with fresh water.—M. Blunno.

The Use of Electricity in the Continuous Sterilisation of Milk.

The desirability of being able to sterilise milk by means of electricity na appealed to investigators in many parts of the world. In our own State experiments have been carried out with varying success, the chief disadvantage being in one instance, the complete destruction of micro-organisms which it might be advantageous to retain.

The attention of the Minister of Agriculture was directed to the success which had attended the efforts of Dr. Beattie, of the Liverpool University, who had discovered a better method of sterilising milk than by the ordinary process of pasteurisation, and a cable was therefore sent to the Agent-General, requesting him to make thorough inquiries into the discovery, and to forward data and mechanical appliances if necessary.

The reply from the Agent-General, just to hand, intimated that Dr. J. M. Beattie, Bacteriologist to the City of Liverpool, the inventor of the process, stated that there were still some details to be worked out before the experimental stage was completed, and that the process had yet to be tried on a large scale. A large plant is at present being installed in Liverpool, and on completion of the same Dr. Beattie hopes to be able to show that satisfactory sterilisation can be undertaken with large quantities of milk. Until this has been proved, and the large plant shown to be successful, the inventor feels that it would not be wise to give many details of his process.

In a communication to the *Journal of Pathology and Bacteriology*, Dr. Beattie and F. C. Lewis, of the University of Liverpool, outlined the causes which led up to the investigation, and gave an indication of the satisfactory results obtained.

The experiments started in November, 1911, first of all in the Pathological Department of the University, and were afterwards continued in the Bacteriological Laboratory.

Experiments were later made at one of the electrical sub-stations of the Liverpool Corporation, and as there was such a promise of success, the City Council erected an electrical plant in the Bacteriological Laboratory, so that the work could be carried out continuously, and where all the factors in the investigation could be under direct supervision.

After satisfactory results of a preliminary nature had thus been obtained, and the possibility of sterilisation thereby established, a considerable number of experiments had to be carried out to determine the correct correlation of such factors as voltage, time, &c. Only a short time of exposure was found to be necessary, and a high-tension current is used.

The advantages of the process are that the milk is not heated unduly, that no coagulation can occur, that a continuous stream can be sterilised, and therefore that the method will be available for sterilising milk on a large scale, such as city supplies for infant feeding, &c.

Some one hundred and twenty experiments on milk in flow were made, and the invariable result was complete destruction of all colon and allied bacilli, and an enormous reduction of bacteria of all kinds. No importance is attached to the organisms left alive, which, so far as could be traced, were air-borne and non-pathogenic. Even these could be destroyed and the milk rendered absolutely sterile by further treatment which, however, was not considered ordinarily necessary. Chemical analyses by the Liverpool City Analyst confirmed those made by the experimenters, and proved the milk to be unaltered in constitution. Enzymes were not destroyed.

The total absence of chemical alteration will be shown from the City Analyst's figures. No alteration in the fat and albuminoid content took place when sterilised, while milk sugar was 5·3 in the sterilised sample as compared with 5·28 per cent. in the untreated, the mineral matter was 0·75 per cent. as compared with 0·77, and the acidity, calculated as lactic acid, 0·19 as compared with 0·18 per cent.

As was to be expected, the acidity of the sterilised milk remained practically constant during twenty-four hours after treatment, whereas the acidity of the untreated controls rapidly rose. The City Analyst reported concerning the samples submitted to him, that even after the ordinary manipulation of the samples for chemical analysis the processed samples remained sweet twenty-four hours longer than the controls.

The taste of the milk is not altered, the fresh "bouquet" being as perfectly discernible after as before treatment. Indeed, upon the samples being submitted to expert dairymen, the opinion they expressed was that they could not discern any difference.

Apart from chemical analysis, feeding experiments were made on a series of kittens, and the nutritive properties of the milk thereby proved to have been unaltered.

Several series of experiments were also made with milk naturally and artificially infected with tubercle bacilli, and in no case did any of the animals inoculated with processed tubercular milk show the slightest sign of tuberculosis upon *post mortem* examination.

The experiments made with this system of sterilisation therefore show that not only can the ordinary milk-souring bacteria and bacteria of similar type, including in many cases spores also, be killed, but in addition evidence has been adduced that both natural and artificial contamination with tubercle bacilli can be rendered harmless. The milk operated upon for the general experiments was the ordinary milk usually obtainable in large cities, and was in no way subject to special selection, and was of varying quality.

Seasonable Work for Poultry-keepers.

JAMES HADLINGTON.

DECEMBER.

DURING the summer months poultry-keepers for the most part will find difficulty in maintaining a constant supply of succulent green feed, and especially if arrangements have not been made well ahead during the spring to provide for the hot dry months, but even at a little extra cost it will pay to make a special effort to keep green feed for them. The immediate return in eggs is not the only consideration, as the health and vigour of the birds is a factor to be steadily kept in view. Nothing should be left undone that will tend to keep the older fowls fit for the approaching moulting season, and the young growing stock developing. If more attention were paid to the stock, both young and old, at this period of the year, it would favourably influence the hatching results of the following season. When the breeding season is over, there is a disposition on the part of many poultrymen to rather neglect the breeders, more attention being concentrated on the growing pullets. While the latter need the best that can be done for them, the former should not be neglected in any way, because the success of next hatching season largely depends upon the breeders.

Breaking up the Pens.

The breeding pens that have been kept in small yards during the breeding season should now be sorted over, and those that it is intended to keep for breeders next season should be put out in more extensive runs, or if possible given free range. Before being put together in this way, each pen as it was mated last season, or special birds that it is desired to keep the track of, should be marked. Where there is a number of pens, this can best be done by using different coloured celluloid leg bands, which are obtainable in a variety of colours, and the special birds kept marked with numbered metal bands. By this method a number of pens can be marked, not only with colours, but by using them on either leg, denoting different pens, and so making another distinction. Of course all these should be recorded in a book kept for the purpose. The hens can then be run together in whatever numbers it is desired or convenient to run them. It is only in this way that proper track can be kept of individuals and pens, so that when mating time comes round again, these records can be consulted as to the meaning and particulars of each marking. Under this system large batches can be turned out together, and given a good range. The roosters can be treated in the same way. Some fighting will of course take place, and losses result, but there is the consolation that the fittest invariably survive, and the sum total will still

be to the credit side. Of course with valuable stud birds a different method will be observed, and the birds kept in pens by themselves. Then those it is intended to dispose of should be marked with a band, denoting that they are to be passed out. A very simple and inexpensive band can be made with No. 14 copper or aluminium, or No. 16 brass wire, by simply winding the wire round a wooden peg or iron bolt, spiral shape. Then slip it off and cut up the centre of the spiral column of wire with the snips, and it will all fall into rings, which can be closed up after being put on the leg of the bird. Hens that are marked to be passed out should now be noted as they stop laying, and marked. Attention to such details as these will tend to constantly eliminate the unprofitable factors, and thus add considerably to the profits, and make much-needed room for the growing youngsters.

Separating the Sexes.

This is a matter in which theory and practice join issue. The practice of many poultry-keepers is to separate the sexes after the breeding season is over. But whatever may be said in favour of having all eggs sent to market infertile, there are other sides of the question that the practical poultry-keeper has to consider, and these are—what to do with his males during the off season, and what is the effect of long separation upon the prospective breeders. It may be said at once that, as far as the more active breeds—such as White Leghorns—are concerned, probably no very great harm occurs with the majority of the birds, but with the heavier and more sluggish breeds—such as Orpingtons—many good birds are rendered partially or wholly useless by long separation, and when the breeding season comes round their owners are at a loss to understand why they have so many infertile eggs. In the light of the above, it will be seen that the separation of the sexes is capable of influencing the results of the hatching season in a marked degree.

Vermin.

A sharp look-out should be kept for the different parasites that infest the fowls and their quarters. The dust baths should receive attention; these are more effective if a little sulphur is mixed in the dust. The houses and roosts should be examined occasionally, and if vermin are found, a good plan is to spray or syringe them with kerosene emulsion, made as follows:—

Boil 1 gallon of soft water and dissolve in it 8 ounces of soft soap, take off the fire and add slowly 1 gallon of kerosene, stir briskly for ten minutes or more until the oil is thoroughly incorporated with the soap water and appears like thick cream, then add slowly, stirring all the time, 10 gallons of soft water (hard will not do). A small quantity of carbolic acid may be added, to make the emulsion a disinfectant, if desired.

If the trouble is very bad, two or even three sprayings may be necessary, at intervals of two or three days between each. This is also very effective against Fowl Tick, and poultry-keepers in infected districts would be well advised to persevere with this treatment, and use wood-preserving oil to paint the perches.

Agricultural Bureau of New South Wales.

NOTES COMPILED BY H. ROSS, Chief Inspector.

Branch.	Honorary Secretary.
Albury	Mr. J. D. Lankester, Albury.
Baan Baa	Mr. P. Gilbert, Baan Baa.
Balldale	Mr. H. Elrington, Balldale.
Bathurst	Mr. J. McIntyre, Orton Park.
Batlow	Mr. A. C. Arnot, Batlow.
Beckom	Mr. S. Stinson, Beckom.
Bonville	Mr. H. B. Faviell, Bonville.
Borambil	Mr. H. A. D. Crossman, "Homewood," Quirindi.
Bungalong	Mr. G. H. Pereira, "Springdale," Cowra Road, *viâ* Cowra.
Canadian	Mr. C. Smith, Canadian Lead.
Cardiff	Mr. F. B. Cherry, Cardiff.
Carlingford	Mr. D. K. Otton, Carlingford.
Collie	Mr. C. J. Rowcliff.
Coonabarabran	Dr. F. G. Failes, Coonabarabran.
Coradgery	Mr. G. C. Harris Wallandra, Parkes.
Coreen-Burraja	Mr. N. B. Alston, Coreen, *viâ* Corowa.
Cowra	Mr. E. P. Todhunter, Cowra.
Crudine	Mr. F. W. Clarke, Crudine.
Cundletown	Mr. S. A. Levick, Roseneath, Cundletown.
Deniliquin	Mr. W. J. Adams, jun., Deniliquin.
Derrain	Mr. A. P. Hunter, Red Bank Creek, Matong.
Dubbo	Mr. T. A. Nicholas, Dubbo.
Dunedoo	Mr. G. E. Alexander, Dunedoo.
Erudgere	Mr. Frank Hughes, Erudgere.
Fernbrook	Mr. W. Marks, Yarrum Creek, Dorrigo
Forest Creek	Mr. W. Thompson, Forest Creek, Frogmore.
Gerringong	Mr. J. Miller, Gerringong.
Grenfell	Mr. G. Cousins, Grenfell.
Gunning	Mr. E. H. Turner, Gunning.
Henty	Mr. H. W. Smith, Henty.
Hillston	Mr. M. Knechtli, Hillston.
Inverell	Mr. W. A. Kook, Rock Mount, Inverell.
Jerrara	Mr. A. O. Lane, Public School, Mullengrove, Wheeo.
Jiggi	Mr. D. Gibson, Daru Farm, Jiggi.
Jindabyne	Mr. Sylvester Kennedy, Jindabyne.
Katoomba	Mr. C. Wooller, Oliva Park Farm, Katoomba.
Keepit, Manilla	Mr. J. B. Fitzgerald, Keepit, *viâ* Manilla.
Kellyville	Mr. Joseph Nutter, Kellyville.
Leech's Gully	Mr. J. Donnelly, Leech's Gully, Tenterfield.
Little Plain	Mr. F. S. Stening, Little Plain, *viâ* Inverell.
Lower Portland	Mr. W. C. Gambrill, Lower Portland.
Mangrove Mountain ...	Mr. G. T. Hunt, Mangrove Mountain, *viâ* Gosford.
Martin's Creek	Mr. P. Laney, Martin's Creek, *viâ* Paterson.
Middle Dural	Mr. H. Porter, Middle Dural.
Milbrulong	Mr. O. Ludwig, Milbrulong.
Moruya	Mr. P. Flynn, Moruya.
Narrandera	Mr. C. F. Pearce, Narrandera.
Nelson's Plains	Mr. V. Schlaadt, Nelson's Plains.
New Italy	Mr. F. A. Morandini, New Italy.
Nimbin	Mr. J. H. Hutchinson, Nimbin.
Orangeville	Mr. C. Duck, Orangeville.
Orchard Hills (Penrith) ...	Mr. H. Basedow, Orchard Hills, *viâ* Penrith.
Parkesbourne	Mr. W. H. Weatherstone, Parkesbourne.
Peak Hill	Mr. A. B. Pettigrew, Peak Hill.
Penrose-Kareela	Mr. L. Pieremont, "Vila," Penrose.
Ponto	Mr. A. D. Dunkley, Ponto.
Redbank	Mr. J. A. Graham, Woodlands, McAlister, *viâ* Goulburn.
Ringwood	Mr. Wm. Tait, Ringwood.
St. Mary's	Mr. W. Morris, Queen and Victoria Stre St. Mary's.

Branch.	Honorary Secretary.
Sackville	Mr. Arthur Manning, Sackville.
Sherwood	Mr. J. E. Davis, Sherwood.
Stockinbingal	Mr. J. Neville, Stockinbingal.
St. John's Park	Mr. J. C. Scott, St. John's Park.
Tallawang	Mr. J. E. Hansall, Tallawang.
Taralga	Mr. Dave Mullaney, Stonequarry, Taralga.
Toronto	Mr. J. G. Desreaux, Esmond, Toronto.
Tumbarumba	Mr. R. Livingstone, Tumbarumba.
Upper Belmore	
Uralla	Mr. E. A. Neil, Uralla.
Wagga	Mr. Thos. Fraser, Aberfeldie, Wagga.
Walla Walla	Mr. H. Smith, Walla Walla.
Walli	Mr. A. V. Bloomfield, Walli.
Wallendbeen	Mr. W. J. Cartwright, Wallendbeen.
Wetherill Park	Mr. L. Rainbow, Wetherill Park.
Wollun	Mr. C. E. Burke, Private Bag, Wollun.
Wolseley Park	Mr. H. McEachern, Wolseley Park.
Wyan	Mr. C. W. Harper, Myrtle Creek Railway Station.
Wyong	Mr. Edgar J. Johns, Wyong.
Yass	Mr. Cyril Ferris, Yass.

Notice to Honorary Secretaries.

It is important that a record of the meetings of the branches should be inserted in the *Agricultural Gazette*, and honorary secretaries are invited to forward to the Department a short account of the proceedings of each meeting, with a brief summary of any paper which may have been read, and the discussion that followed it, as early as possible after each meeting. Notes for insertion in the *Agricultural Gazette* must reach the Department before the 16th to ensure insertion in the following month's issue.

Insect Pests.—Quite a number of the branches have availed themselves of the Department's offer to supply a set of insects, being the common pests of the district, and the collections are now being cased. The Government Entomologist suggests that as each district has certain pests peculiar to its orchards and gardens, more useful work would be done if the members themselves collected the local pests (orchard, garden, and stock) and sent them to the Department, where they would be arranged, mounted, a descriptive label attached, and returned to the branch. Mr. Froggatt considers that such a collection would have a far greater value, as there would be more interest attached to the specimens when the members knew exactly where the pests came from, and where and how to find them.

Demonstrations in Clearing Land and Subsoiling with Explosives.

A limited number of demonstrations in clearing land and subsoiling with explosives will be given by Mr. H. C. Coggins, Assistant Inspector of Agriculture, to branches of the Agricultural Bureau. Branches who wish to take advantage of this offer are requested to make early application to the Department through their honorary secretaries.

Veterinary Lectures.

In connection with the lectures to branches of the Agricultural Bureau, it is herewith pointed out for the information of honorary secretaries that the following is the list of subjects of lectures which can be delivered to them :—

Horses.—(1) Conformation and Unsoundness (with lantern illustrations) ; (2) Colic and Treatment of Wounds ; (3) Strangles, Influenza, and Tetanus.

Cattle.—(1) Tuberculosis (with lantern illustrations); (2) Contagious Abortion and Contagious Mammitis; (3) Ticks, Tick Fever, Tick Infestation and Eradication.

Sheep.—Parasitic Diseases of Sheep.

Pigs.—Diseases of Pigs.

General.—(1) Parturition of Farm Animals (with lantern illustrations); (2) Feeding of Farm Animals and Dietetic Diseases; (3) Sterility: Causes and Treatment in all classes of Stock.

Bee-keeping.

A series of lectures on bee-keeping is being arranged by Mr. R. G. Warry, Instructor in Apiculture. Secretaries, whose branches intend availing themselves of this opportunity to receive a practical insight into this branch of agriculture, are requested to make early application.

REPORTS AND NOTICES FROM BRANCHES.

Balldale.

At a meeting of this branch on 11th October, Mr. G. E. Becker read a paper on "Poultry as generally found on the Farm." He urged that farmers should improve their poultry flocks by purchasing settings of eggs from breeders of good repute, not fearing to pay up to 10s. 6d. and even 21s. for eggs from good stock birds. Better houses and roosts than are to be found on the average farm should be provided, and the perches should all be of one height, viz., 18 inches to 24 inches from the ground. The addition of Epsom salts to the drinking water at intervals was advised, and also the provision of a little lime-water. He also preferred to raise the chicks by means of the incubator, and had found it a good plan to work two incubators rather than one big one, starting both together and letting them run to about the seventh or ninth day, when infertile eggs are removed and all the eggs are put into one machine, the other one being started on a new batch.

The following paper was read by Mr. C. D. Young at the meeting on 25th October:—

HAY-MAKING.

My experience is that there must be very great care in preparing the land for cropping for hay.

The hay must be clean in the butt, and free from grass and rubbish.

Wheaten hay should be cut whilst in the dough stage, as then you get a nice green colour, and it is of the highest feeding value. If possible, stook each day's cutting on that day, with not more than sixteen to twenty sheaves in each stook. When the stook is standing, pat it in all round on the top with the hands, so that all the sheaves bear in towards the centre, and you will find very few stooks blown down, and if it should rain very little will go into the stook, unless in extremely stormy weather.

To test the hay to see if it is ready to stack, in about nine to fourteen days after stooking pull a few straws out of the centre of the stook, and bend over short; if they break in the centre of the knot the hay is practically ready to cart in.

Oaten hay is usually cut after wheaten, or when the head is half white and the flag has a pink tinge in it. The average crop for oats is about 2 tons, and for wheat 1½ tons per acre. The great drawback in some districts is the labour problem. The best way I found to deal with hay was to work with four men, two to load, and two to pitch up; then you have a spare man to help to turn the sheaves, and to attend to the horses, and with one waggon and four men, we could average 10 tons per day.

After years of experience with the thresher and chaffcutter, the handiest stacks we have found to handle and to build are stacks 36 feet by 15 feet, with round ends and walls 1 feet to 11 feet high, and with a roof quickly taken in. They shoul hold from 25 to 30 tons of chaff. As regards cutting chaff, it is cut in 30-bag runs, steamed with

a steam box 21 feet long with about 60 lb. of steam, and the ton of chaff is usually put in about twenty-four bags.

I had a quantity of hay at one time on my farm at Coolamon, all from the same paddock, and cut and handled the same. For part of it I was very glad to take £1 per ton in the stack, as it was very grassy in the butt, and for the remainder of the paddock, which was clean, I got £3 10s. in the stack. The better lot was sold in Sydney for £6 10s., while the grassy chaff was sold on the trucks at Coolamon for £3 to feed starving stock.

The best return I have got was when I put in fallow land with some quick-growing wheat, such as Steinweidel or Bunyip, cut it for hay, and then the next year sowed oats, and cut for hay also. The following year I sowed wheat for shipping. I could always depend on a five-bag crop.

Batlow.

At the first meeting of this branch on the 13th September, Mr. A. C. Arnot Hon. Secretary, read a paper on a trip through the orchards of Tasmania and Victoria, which will appear in our next issue.

On the evening of the 10th November, Mr. H. O. Oliver, M.R.C.V.S., gave an interesting lecture on the "Horse." He touched on methods of feeding, dietetic diseases, unsoundness, cures, &c.; and also dealt briefly with pigs and their diseases, and at the conclusion of the lecture answered several inquiries.

Bungalong.

The annual meeting of the above branch was held on the 16th October. The Hon. Secretary reported that during the past year eight meetings had been held. Papers had been read on "Methods of Pickling Wheat"; a lecture delivered by Mr. Wilson on "Wheat Culture"; and another by Mr. H. O. Oliver, M.R.C.V.S., on "Conformation and Unsoundness in Horses."

The following gentlemen were elected office-bearers for the ensuing year:—Chairman, Mr. J. Clements; Vice-Chairmen, Messrs. D. and B. Bryant; Treasurer, Mr. R. Hughes; and Hon. Secretary, Mr. G. H. Pereira.

Canadian.

A new branch has been established at Canadian Lead, near Gulgong, with the following gentlemen as office bearers:—Chairman, Mr. F. S. Stacey; Vice-Chairman, Mr. R. C. Hollow; Treasurer, Mr. G. A. Strehir; Hon. Secretary, Mr. C. Smith.

Coradgery.

At the last meeting of this branch three very interesting papers were read on the eradication of black oats, each of which made useful suggestions.

Mr. M. J. Kelk treated the matter in the following manner:—

The Eradication of Black Oats.

Since this is admittedly a difficult problem let it be supposed for the purposes of this paper that the suggestions offered are matters of definite knowledge—just to facilitate the style of writing. Regarding the seed, observations will reveal peculiarities which will have to be considered in any scheme for the eradication of the pest. Seed has been known to lie dormant, but virile, in the ground for many years. Hence the method employed must be one that will cause all the seed to germinate as early as possible. To this end, as soon as practicable after the area to be treated has been stripped, let the stubble be burned off, and the land immediately scarified with the spring-tooth culti-

vator. The surface mulch thus created will tend to retain the subsoil moisture, and assist germination as well as making it practically certain that the land can be ploughed when the time arrives. This time is when the plants are well grown, but not so big as to be either showing signs of seeding, or too big to be completely covered by the plough. It may be as early as July or as late as September, but as a general rule from the middle to the end of August will be found the most suitable time to plough. Immediately after ploughing, let the land be harrowed. This will put a partial tilth on the surface and also serve to disturb and pull out any plants that may have been imperfectly covered. From this on to seeding time, treat the land as ordinary fallow, scarifying out all growth as occasion demands. The succeeding crop of wheat should on no account be sown before the end of May or beginning of June, since the month of May is the time most favourable to the germination of black oats. Let the cultivator be put over the land immediately prior to seeding, in order that all young plants may be pulled out and killed. On no account during the whole course of treatment may stock of any kind be allowed to run on the land. If this precaution is neglected, it will be found that owing to the compression of the sub-surface many seeds will be thrown temporarily out of action, only to reveal their presence when least desired. This is a point that will bear emphasising, as it will be a big temptation to utilise the growth during the fall and early winter for grazing purposes. But since the objective, first, last, and all the time, is a clean field, any sacrifice found to be necessary will have to be made. It may happen that one treatment will be sufficient to reduce the pest to so few that any plants showing in the crop the second spring may be pulled out by hand, but if they are too many, let the treatment be repeated the following year. The necessity for the use of only absolutely clean seed and feed is obvious.

Mr. W. E. Taylor said :—

The problem of eradicating black oats seems to be one of the most difficult of the many the farmer has to face, and taking the term "eradicating" in its literal sense, at present an impossible one, unless he is prepared to leave badly infested paddocks out of cereal crops for several years. One method to deal with very dirty paddocks, which I believe has proved to a more or less extent successful, is to sow early a quick maturing wheat, such as Firbank or Bunyip, and cut either for hay or ensilage, before the black oats are ripe. But I take it what we want to arrive at is how to grow wheat on ground that is oaty, with a minimum growth of the pest. To accomplish this I would advocate the following method, viz. :—Fallow early, work the ground with tine-cultivators and harrows if at all lumpy, as frequently as possible, to encourage growth of oats, and feed them off as they grow. Continue this process till time for seeding, then work thoroughly with one-way disc, drill to follow same immediately, using a fertiliser to give the wheat a quick start, and so establish it before the remaining ungerminated oats get a chance to grow to any extent. The object to keep in view, from the time the land is ploughed, is to use all possible means to force the growth of oats in the soil, destroying same as they grow, and when wheat is sown, to get it started well ahead of any oats that the first method has failed to germinate; from observation I feel sure the use of fertiliser will materially help to accomplish this.

A farmer starting with clean ground, using only clean seed, avoiding the use of oaty chaff-feed, working his paddocks so that each one is fallowed every third year, and treating the fallow as above advocated, should have little difficulty in keeping his ground comparatively free from black oats, and so can lessen by one the many difficulties he has to contend with.

Mr. H. N. Marriott's views are given in the subjoined extracts from his paper :—

Let us start with a very dirty crop first harvested As soon as possible, plough a fire-break round it and set fire to the stubble. This will burn some of the oats and help others to germinate more easily, and also leave the ground clearer for preparing a good seed-bed. Turn it over with a one-way disc, or some implement which will work up a shallow and fine seed-bed, for such the wild oat likes most, and you should thus ensure a good germination after the first good rainfall. When nicely up and the ground not too wet, turn the sheep on—enough sheep to keep it closely eaten off and bare until well into February, when you could plough it up pretty deep for a crop of rape. Rape could be put in by the middle or end of March, sowing broadcast 7 or 8 lb. per acre; seed price, 3d. or 4d. per lb. If sufficient rain has fallen, it should be fit to graze in about ten weeks after sowing. Much advantage could be obtained if the paddock were temporarily subdivided, say with wire-netting and stakes, so that one-half could spell while the

other was being fed off. By the middle of November a good ploughing should clear all weeds and remaining black oats, and leave the paddock in a fit state to grow a vigorous crop of wheat by sowing time. To cut a dirty paddock for ensilage before the oats have more than first come to head, then feeding off the second growth which is bound to follow on an early cutting and ploughing up, should also be a fairly profitable and effective means of cleansing a paddock of black oats.

Bare fallow, of course, ought to be good, but in a district like ours with a very fair rainfall, I doubt if it would prove a profitable or necessary method.

To choose the best means for combining efficacy and profit, I would pin my faith to a well-selected rotation of crops, and feeding off to keep the ground in good heart the whole time. There is no doubt that there still remain to be found plenty of suitable and paying crops other than wheat for our district, and that they could be profitably used as a means to help the extermination of the rightly abused black oat. In choosing the variety of wheat to sow on a paddock likely to be infested with oats, I think a quick maturing variety, such as Firbank or Bunyip, with superphosphate, should stand the best chance.

In all operations on the farm it is necessary, of course, to use clean machinery, clean seed, clean feed, and even clean bags.

Henty.

At the usual monthly meeting held on the 17th October, Mr. C. Pedersen, Dairy Instructor, gave a lecture that touched a subject discussed at the previous meeting of the branch.

Prospects of Dairying in the Henty District.

Mr. Pedersen said dairying had for many years occupied the attention of a number of farmers throughout the States, and in the State of New South Wales had transformed some of the districts. He pointed out the business expansion along the North Coast rivers due to dairying, showing the effect of the altered conditions from a problematical return once or twice a year from agriculture, to the certain fortnightly cheque for cream or butter. The inducements offered for export (notwithstanding the recent decline in exports) were so great that they deserved greater attention by district associations. England could and would take all the butter that New South Wales might send, and the dairying resources of the State were very great. He had been asked if he thought Henty was a suitable place for dairying, and he was glad to have been able to drive round before answering that. He said emphatically that the conditions were suitable. He believed a thousand dairy cattle could be kept on the Doodle Cooma Swamp, if it were cut up into dairy-farming blocks, and portion of the surrounding high land given in with it for homestead, feed-growing and emergency purposes. Dairy-farmers on the swamp would do well, but it would not be a successful project to put settlers there who were ignorant of dairying. It was like anything else; a man required to know about it and to put his knowledge to use. Suppose dairying were started in the Henty district and run in opposition to wheat, one direction in which farmers would gain was in the freight to market on their produce. It cost 11s. 2d. per ton to send wheat to Sydney, and £100 worth of wheat, allowing 3s. 3d. per bushel, would cost the producer £10 12s. in freight, while £100 worth of butter would only cost in freight £1 8s. 7d. So that the dairy-farmer would save £9 3s. 5d. in freight alone on every £100 worth of produce he sent away as compared with his fellow wheat-grower.

One absolutely essential thing in dairying was pure water. He thought that could be obtained by sinking for it on the swamp. He did not approve of dairying cattle being given the run of open dams in paddocks as he had frequently seen in wheat districts. It would therefore be necessary, if dairying was entered into at Henty, to provide good water for the cows. Mr. Pedersen then went on to say that a dairy cow that did not yield 250 lb. of butter during a lactation period of 273 days should not be kept. If 11d. per lb. were taken as an average price for butter, such a cow would yield in butter £11 9s. Her calf and by-products should bring the yield up to £15 for a milking period, provided proper use were made of the separated milk. Accordingly, twenty cows of such a standard would, roughly calculated, then bring in £329, which was a good living for a small family, as only a small family would be required to look after such a small herd.

Mr. Pedersen showed on the screen a number of cattle and dairying scenes, which enhanced the interest attaching to his lecture, and he was accorded a hearty vote of thanks.

Mr. R. G. Warry, Demonstrator in Apiculture, gave a lecture at Henty on the 6th November. During the lecture it was pointed out that in the yellow box country, such as the Henty district, it was of considerable advantage to be able to remove combs filled with honey from the hive, extract them, and return the empty comb, as quickly as possible. For this work the shallow extracting comb was recommended as more durable than the deep Langstroth pattern. A short account of swarming, and the advisability of allowing only prime or first swarms to issue, was given, followed by a description of the pests and diseases found in colonies of bees, together with the best known methods for their detection and eradication.

Hillston.

A new branch has been formed here with twenty-three members. The office-bearers are :—Mr. Wm. Cashmere, Chairman ; Mr. T. Lapthorn, Vice-Chairman ; Mr. M. Knechtli, Hon. Secretary and Treasurer.

At the next meeting Mr. R. McKenzie will read a paper on the best methods for the destruction of rabbits.

Inverell.

At the September meeting of this branch, Mr. G. F. Lewin read an interesting paper :—

Maize Culture.

Mr. Lewin said the soil most suitable for maize-growing was a well-drained, friable soil with a fairly firm subso.., and having a fair percentage of clay in its composition. To ensure good crops the soil must be rich in all plant-foods, viz., nitrogen, phosphoric acid and potash. Most of the Inverell soil where maize was grown contained a sufficient quantity of nitrogen and potash, but it would well repay any farmer residing within 10 or 12 miles of a railway station to add from 60 to 100 lb. of superphosphate to the acre at sowing time. Providing that all conditions, such as weather, &c., were favourable, the first ploughing should be done from two to four months before the planting, and, if the rainfall was light and the ground grew no vegetation or weeds, it should be left in the rough state as long as possible. If weeds grew, then the ground should be harrowed and scarified. The last ploughing should be done from one to two weeks before seeding, according to the weather conditions.

The variety of the maize to be grown was of the greatest importance. He believed there was no plant so susceptible as maize to improvement by picking the best seed for planting. From his own experience he would choose what was called a medium corn—a corn that under natural conditions would grow to a height of 8 or 9 feet, with the cob hanging about 4 feet or 4 feet 6 inches from the ground. All seed-corn should be gathered in the paddock while the corn was still standing. It should be husked by hand and the grain on the small end discarded.

The best months for planting were October, November, and up till about 20th December. The soil should be in as fine a state of pulverisation as possible before drawing out the drills for planting. The drills should be 5 to 6 feet apart and about 4 inches deep. He advised the dropping of single grains 12 inches apart, or two grains 24 inches apart, or, as is mostly the case in this district, three grains 36 inches apart. Where the ground was full of last year's weeds, the better plan was to draw the drills about 4 feet apart, and then striking another set at the same distance apart at right angles to the first, sow three grains at the intersection of each drill. This enabled the farmer to scarify both ways.

The harrow should be run over the young corn after it was well above the ground. This tended to kill all small and young weeds as well as conserve the moisture. After that he advised that the harrow, scarifier, and disc-cultivator should be kept going after every fall of rain, provided the ground was in a fit state to work. There was no crop that responded more freely to intense culture than maize.

Mr. Lewin said that corn had been sown locally in ground totally unsuited for it. In some cases the soil was so poor that it did not pay for the trouble put into it. Again,

he was sorry to have to say that his brother farmers were years behind the times. They continued to farm on worn-out lands, obtaining a yield of 9 or 10 bushels per acre, when the addition of manure would double their crops. In support of this last assertion, Mr. Lewin exhibited a number of specimens of corn grown in practically worn-out land with the addition of superphosphate. These specimens clearly pointed out the advantages accruing from the judicious use of manures.

Discussion.—Mr. A. HUNT asked whether the black soil required much manure.

Mr. LEWIN said it depended upon how long the land in question had been worked.

In answer to a further question by Mr. HUNT, Mr. LEWIN remarked that it was not always advisable to grow the same crop year after year. In sowing maize it should never be sown too thickly. In this district more crops were ruined in that way than by the lack of moisture. The speaker displayed some very fine cobs of corn, which he considered one of the best for the district. It was a medium growing corn. Vigorous growing varieties were only suitable for the coastal districts. With properly worked soil, crops should be grown with 5 inches of rain.

Mr. DITZELL was of the opinion that maize did not improve with excessive cultivation.

Mr. ARKINSTALL said he did not agree with Mr. Lewin in planting the corn 5 or 6 feet apart. Growing some varieties of corn was only wasting land. A big corn might benefit by thin sowing. The drills should be drawn as light as possible, 2 inches deep for preference. Then the planter should be run through so as to plant about 4 inches deep. In that way the seed was planted in the damp soil. In connection with manure, unless the land was worn out it did not pay in this district to apply artificial manures. Too much green stuff could not be ploughed under, however, as any soil benefited by humus. It should be ploughed in early in order that it would decompose in good time, otherwise it would let the air into the soil.

Mr. LEWIN could not understand anyone being against the application of artificial manures. The results from his orchard alone were sufficient to illustrate the great gain. He exhibited two navel oranges aggregating 2½ lb. in weight and grown with the aid of fertiliser. He concluded from them that it did not matter how good the district was it paid handsomely to use manures. It even paid to manure to get the green stuff to put humus in the soil.

A vote of thanks to Mr. Lewin concluded a very interesting debate.

On the 10th October the usual monthly meeting was held, when Mr. H. R. Alexander gave the second instalment of his address on dairy cattle :—

BREEDS OF DAIRY CATTLE.

Mr. Alexander said that amongst the dairy herds of New South Wales, Shorthorn cattle, including Illawarras, come easily first. The next in popularity are Jerseys, which are running the Shorthorns a good second. Ayrshires, Guernseys, Holsteins, and Kerries follow in the order named. Amongst the breeds mentioned will be found cattle suited to every climate and class of country to be met with in the dairying and partly-dairying districts of this State. Ayrshires are now fairly plentiful, Guernseys are rapidly becoming plentiful, and will soon be much in evidence. Holsteins are magnificent cows, and Kerries are also a very fine breed.

Shorthorns or Durhams are one and the same. They were brought up on very rich fattening country, and need good class land where they can get plenty of good food without much trouble. Under these conditions they will yield as much butter-fat as any cattle known. If Shorthorn heifers are put on to rich country, they are inclined to fatten and grow quickly, and there will be a percentage not likely to breed, unless carefully managed.

Both Jerseys and Guernseys are butter-producing animals; they do not yield the flow of milk that Shorthorns give, but will give the butter-fat. The Jersey Herd Book is now getting very strong and doing good work in keeping a proper check on this breed of cattle. We have at present a fine lot of Jerseys in Australia, and they suit our country admirably, particularly for the butter industry, but not so much for cheese-making. They are early maturing animals, with a tendency, if not allowed to breed fairly young, to fatten up and grow barren. It is judicious to allow them to breed a little on the young side. I am not too keen on recommending the Jerseys for crossing purposes as you get all sorts and conditions of colours. My advice to anyone going in for Jerseys is, stick to pure breds.

The Guernseys are bred practically on the same lines as the Jerseys, but are bigger and coarser-boned animals, consequently they give a little more milk, which is equally as rich as that of the Jerseys. You cannot beat a Guernsey bull for crossing. The majority

of calves throw towards the sire in colour and appearance. The Guernseys give a percentage of butter-fat up to fully 4 per cent. The Jerseys give dirty colours in crossing, whereas the Guernseys give a beautiful yellow colour.

The Ayrshires can stand much rougher country and harsher conditions than either the Jerseys, Guernseys, or Shorthorns. Ayrshires are real good foragers, and will stand a dry pinch better than any of the previous mentioned breeds. As breeders, the Ayrshires are one of the best, giving very little trouble as regards abortion and barrenness. There is a good deal of abortion on the Rivers, but I have never had any of my Ayrshires slip there. The lactation period of the Ayrshires is a prolonged one. They are inclined to be a little bit timid and nervy, otherwise they are excellent cattle.

The Holsteins are one of the very oldest breed of dairy cattle, originating in Holland, the home of dairying. They are magnificent milk-producers, and in cheese-making cannot be beaten, although the milk is somewhat deficient in butter-fat. The Holstein yielding 4 gallons is a very valuable cow. On the South Coast, at Bodalla, they have fully 400 Holsteins, 150 of which are practically pure-bred. On that property the pastures are ideal for Holsteins. They are a breed that like flat country, and not too much exercise in foraging for their food. Last year on Bodalla a herd of about 100 Holsteins, with an average of 90 milking all the year round, gave 750 gallons of milk for the year for every cow carried on the farm, which under Australian conditions is a record.

The Kerries are the only pure breed of cattle originating in Ireland that is considered worth mentioning. They are exceptionally hardy, and give more milk under adverse conditions than any other cattle I know of. At Hawkesbury College they are developing, crossed on grade Jerseys, into very fine dairy cattle. There are very few Kerries in this country. The little Dexter-Kerry is an offshoot of the Kerry, and some authorities say they result from Kerries being crossed with Devons.

Taking the breeds mentioned, we have cattle suited to every class of country and environment. If you want to cross you cannot do better than use a good Ayrshire bull. The Ayrshire immensely increases the lactation period of the Shorthorn. The Ayrshire-Shorthorn cross gives a much wider stretch, and gives a spread and depth of udder that is highly desirable, the result of which can be seen on Illawarra dairy cattle. A Guernsey bull for crossing purposes is also excellent, and much in favour on the Northern Rivers. If you want to increase the butter-fat, get a Guernsey bull.

The heifer wanted for dairying purposes should never be allowed to fatten until she proves in calf, for fat heifers are often difficult to get in calf. Young dairy stock should be maintained in good growing condition. The tendency to lay on fat, if developed in the young heifer, may remain and be characteristic of her after-life. The milking cow that fattens, as a rule, does so at the expense of her milk flow. Heifers that are starved and stunted in growth from a lack of development of digestive and other organs, rarely, if ever, develop into good heavy milkers. The lactation period of a cow may be prolonged, and a persistent trait cultivated, by keeping a heifer in milk on her first calf even with a somewhat diminished flow.

Turning to the subject of lucerne feeding, given good crops of lucerne I unhesitatingly say cut the crop. Unfortunately, where no irrigation system is installed, it is frequently found during dry weather to be impossible to get a reasonable cut, the stand being so short. Grazing under such circumstances is the only method of dealing with the crop. There is always the risk of bloat, particularly during the early stages of growth of the plant. The probing, tro har, and emetics in the form of Stockholm tar, carbonate of soda, linseed oil and turps, are all methods of dealing with hoven or bloat, well known to local farmers. We also have the idea of fastening a bit in the cow's mouth to prevent the cow from eating too ravenously and to keep her working her tongue, and between the two actions the cow breaks much wind, the result being no bloat. The advantage of some green feed, such as oats, maize, sorghum, &c., given to the cow before going on the lucerne is also well known, but even when given some other green food, cows have been known to give hoven trouble. Locally, the growth of lucerne was particularly good during the winter and spring months of the present season. At no period would the crop be fit to cut, but it made excellent, though somewhat risky, grazing. Having a good supply of silage, I found that where silage was fed first thing in the morning, the cows could remain on the lucerne all day and never blow, but where no silage was fed, the cows gave trouble. The ensilage given per cow was reduced to 5 lb. daily, given after the morning milking. The cows would be turned on the lucerne by 9 a.m. and would remain on until 4 p.m. Not a single cow that had been fed on silage gave any hoven trouble. When the silage ran out on one farm, fully twenty cows suffered from bloat within twenty-four hours, and had to be treated. When the cows were again

fed with silage, the blowing ceased. This system of bloat prevention is well worth a trial; and from what I have seen, I believe it will be found to be the most practical and reliable system of dealing with cows grazing on lucerne. I would unhesitatingly recommend a small feed of silage daily, all the year round, where cows have to be grazed on lucerne paddocks.

The subsequent discussion followed very interesting lines, and the meeting closed with a vote of thanks to Mr. Alexander.

Katoomba.

Mr. R. G. Warry, Demonstrator in Apiculture, gave a demonstration on the manipulation of the modified Bolton hive to members of the Katoomba branch on Friday, 24th October.

Comb-building in the Bolton hive was first described, when it was shown how inversion and changing the order of the stories of the hive would enable the apiarist to get his frames filled with comb. A short description of the condition of the brood chamber at swarming time illustrated how the Bolton hive could be utilised to check swarming. The area of comb used for brood-rearing in the Bolton hive was compared to that used in the Langstroth hive, and it was shown how an area of brood comb equal to from eleven to twelve Langstroth combs could be obtained full of brood at one time in the Bolton hive when it was not easy to get so much brood as this at once in the Langstroth hive. It was also demonstrated that the Bolton hive permitted the apiarist to examine a colony more quickly than the Langstroth; Bolton frames being examined by sets of eight at a time, while Langstroth frames had to be examined separately.

In the evening of the same day a lantern lecture on bee-keeping was delivered to the members of the branch. During the lecture it was pointed out that whilst a vigorous queen bee was of primary importance to a colony, a great deal of the apiarist's success depended on the use of sound comb. An illustration of comb built by bees in a glass case without any comb foundation, followed by a slide illustrating a well-built comb in a wired frame, helped to emphasise this fact. A good method for dealing with old and uneven combs was detailed, together with the use of the "Hatch Wax Press." This was followed by a description of the pests and diseases found in hives of bees, and the best known methods for their detection and eradication were mentioned.

Lower Portland.

Mr. J. H. Northrop, member of this branch, gave a very interesting lantern lecture on the "Moon and General Astronomy" at the last meeting of this branch.

A paper, compiled by Mr. R. M. Smith, was read by Mr. H. H. Watts at a meeting on the 11th October.

Pig Raising.

In taking up the raising of pigs, the first thing to consider is a good run. If you have not got this, do not think of raising pigs in a sty. You can utilise your surplus feed to better advantage by buying up such suckers or slips as are generally for sale, and fattening them for market. Any farmer who keeps a cow or two with the necessary paddock can easily and cheaply arrange a run, by fixing wire netting, say 2 feet high, round his paddock. Netting of 4-inch mesh and of thick gauge is best, and pig raising will soon recoup the outlay, and show a substantial profit.

Having provided the run, the next work is to select the sow, or sows, and above all things be careful not to overdo it. Many farmers can run one sow on their surplus feed, who cannot profitably keep two.

It is not so much the keeping of the two sows, but the rearing of their progeny to the best advantage. I do not like the larger breeds. I would select a sow from a good litter, short legs, thick set, even thickness across the back, with plenty of ham, and with not less than twelve or fourteen even teats. The breed I prefer is the Improved Berkshire. The Middle York is also a good type, but is not suitable in a hot climate like this. Being white, the skin is more tender, and gets scalded in the hot sun; then it becomes scabby, which irritates the pig, and prevents it from doing well, and also shows up badly in the sale yard. I am sure there is nothing in the pig line that can be got up to advantage like a pen of Improved Berkshires. The purer the breed the better. Always avoid a sow that is inbred, as there is no animal in which this will prove so disastrous more

quickly than the pig. When you have secured your sow, make haste to get on friendly terms with her; treat her with kindness, and she will repay you for your trouble in the end. A young sow will require your attention at time of farrowing, and if she is not used with kindness the moment you go near her bed she will be disturbed. With no other intention than protecting her young, she may charge at you across the bed, and perhaps kill or maim half the litter in one act.

The pig is entitled to a great deal more respect than it often receives. It is known by many as a dirty, loathsome animal, and small wonder that it should be, as in many instances from generation to generation the food has been served to them in small sties, which are half their time no better than quagmires. If your run has plenty of grass and herbage, the sow will want very little feed. Most farmers keep a cow or two, and the refuse milk will suffice, as you should avoid forcing the growth of a brood sow. Keep her in a good, healthy, strong condition, but do not fatten her. If you have feed that you cannot reserve for poorer days, and that you have no other use for, I believe it is better to burn it than to overburden the brood sow with fat. Having kept the sow in this way till she is nine months old, she will be quite big enough to mate with the boar.

When mating, see that your sow is thoroughly hogging, and that both are undisturbed. It is better to keep the boar away from sows, and take the sow to the boar, and not the boar to the sow. Many breeders are under the impression that one service is sufficient, but I believe the best results are secured by leaving the sow with the boar till she has completely gone off season, which will be about three days. In my own experience I have taken the sow away earlier on two occasions, and on each she had small litters. When you have mated the sow, it is well to calculate the time of farrowing (which will be about sixteen weeks), as you will then know when your attention is required. It will be well to allow her freedom as long as possible, and when within a day or so of farrowing place her in a clean, dry sty, with a little bedding and plenty of room. I do not like to see sufficient bedding for the sow to cover herself, as some of the litter may get entangled and are apt to be trampled on. Keep a look out for trouble while farrowing, especially with young sows, as in many instances they will have a small litter of large pigs, and sometimes have great difficulty, and unless assistance is given you may lose the sow. On no account give a young sow maize before farrowing, as you are almost certain to bring on septic poisoning, and milk fever; also avoid feeding in any quantity for twenty-four hours after farrowing. A small drink of warm milk or gruel made with bran, say half a dipperful, may be given about twelve hours after as a refresher.

Having taken all the care mentioned in the selection and rearing of your sow, you may be disappointed in the first litter, but do not discard her on this account. Many of the best sows have a small first litter. When the litter is five or six days old you may feed the sow all she will take. Up to this time she will be drawing on the fat supply that nature provides for all mothers in a state of pregnancy. It is advisable at this stage to give, in addition to milk-producing food, something for the sow herself, in the form of maize or some kind of grain. She has a long way to go with from eight to twelve pigs drawing on her for seven or eight weeks. When the young pigs are four weeks old, it is a good plan to have a trough so arranged that they can get a little feed to themselves, without being knocked about by the mother, as from then on they will do much better with feed. When six or seven weeks old I always castrate the boars, leaving them on the sow for a week and then weaning them. When the young pigs are taken from the sow, she should be fed entirely on maize, and given only water to drink; she will be hogging again in from four to seven days, and no time is lost.

I would now feed the young pigs in the same manner as I suggested for the young sow, with sufficient grass, &c., and enough feed to keep them in good condition, not fat, till they are about three months old. Then I would pen them to fatten for about a month, when you should have pigs from 60 lb. or 70 lb. weight—the very best selling weight. After this weight is attained there is a period when bone is produced instead of meat, and also as weight goes up, the price goes down.

I have a sow which I treat in this way, and she is never idle; she is either rearing or carrying pigs—two litters a year. Only keeping one sow I am able to keep the progeny moving in this way at a very small cost. I have not kept a record of her doings, but having received a return of her last litter since I promised this paper, I am able to give the figures. I received £17 10s. clear for this litter of ten pigs under four months old. Of course, pigs have been bringing big prices, but I am sure that that sow is worth £25 a year to me. I have given you my way of rearing pigs on a small scale, but the same method may be used on a large scale if such crops as lucerne, rape, pumpkins, turnips, &c., are grown to supply the pigs with growing material. Above all, always keep your pig from worrying about the fact of being a pig.

New Italy.

At the annual meeting, held on the 11th October, the present office-bearers were re-elected for the ensuing year. The report of the secretary showed that fourteen meetings were held during the past year, comprising two special and twelve ordinary meetings. Lectures given by departmental officers were fairly well attended.

Nimbin.

At the meeting held on 11th October, Mr. J. Shipway (on whose farm is the Government Experiment Plot) exhibited some good samples of green winter fodders—Thew and Huguenot wheats, Algerian oats, black winter rye, and grey field peas. These all looked well, despite the fact that they had been through an exceptionally wet period.

On Monday, 13th October, Mr. C. J. Sanderson, M.R.C.V.S., of the Stock Branch, gave a demonstration of speying cattle in the afternoon, and in the evening he lectured on "Ticks and Tick Fever, Contagious Abortion, and Contagious Mammitis."

There were between fifty and sixty farmers present, many of whom came some miles. The lecturer handled each subject plainly, pointing out the risks to which stock-owners were exposed, and the necessity for trying to prevent, as well as how to treat, these diseases when they break out.

Many questions were answered by Mr. Sanderson, and he also gave valuable information concerning the tuberculin test.

The Sheep and Wool Expert will visit this district and give a lantern lecture on sheep-raising, on the evening of the 15th December. He will spend a couple of days in the district previous to the lecture.

Orangeville.

This branch held a very enjoyable picnic on 18th October.

A paper entitled "The Farmer's Home" was read by Mr. R. H. Taylor at the last meeting of the above branch.

The Farmer's Home.

In selecting this subject, I was guided principally by the influence which the home has on the rising generation. It has become apparent that we as parents and heads of families are wanting in some respects when we see the great rush of young people for city life in preference to that of the country.

What is the cause of this? The question has to be answered, and the problem of trying to solve it should be undertaken by every man on the land. We all know that the town offers more attractions in the way of amusements, such as sports and entertainments, and when city visitors come along and talk of all these things, it starts the young people wishing to be there, and then, without some strong counter attractions to overcome this desire, off they go. You naturally ask what can we do to prevent it? The answer is, make the home attractive, and create a healthy desire to know and understand all the work of the farm.

Taking the home or house first and going round the country to observe them, what do we find? I am sorry to have to say they are in many cases not what they should be as regards situation, general plan, furniture, and outside appearance. In how many cases do you find the house in a hollow, quite close to a creek or dam, instead of being on an elevation, which is always preferable for health reasons. But the general plan is usually

much worse. The house is a cluster of small buildings, more or less usefully situated, but in many cases detached, thereby causing much labour to keep in order. The building should be so planned that a maximum amount of room is given in a minimum amount of space, and so arranged that the work of keeping it clean and in good order does not entail unnecessary labour. This is a very necessary thing to attend to, as by economising the time of the mother of the family she can make the home more comfortable and inviting. This is the natural wish of every woman, and it should be our endeavour to gratify that wish, as we ourselves, in conjunction with the other members of the family, enjoy the benefits so derived. The rooms should be large and airy, with plenty of light and ventilation. A verandah on three sides is very essential in a climate such as this, as it tends to keep the house cooler in the summer, and is also useful for outdoor sleeping. The furniture should be good, if plain, with a greater idea to usefulness than ornamentation, although the last must not be lost sight of altogether. The outside appearance should be tidy, the fences in good order, and there should be a nicely arranged flower garden. The water supply is a very important matter, and in many cases could be improved, for with small cost it would in most cases be possible to have it laid on to the kitchen and bathroom from an elevated tank. Even if all of this were done, it would not settle the question of the loss of the young people, although it would be a step towards it, as it would inculcate a "pride of home," which would have its natural influence when they saw their home as nice and attractive as those of the town.

But more is wanting yet. The mind of the young is always on the move and wanting information. Now is the time to give it. Do not be satisfied with the result of the work done in school, but try and help it by stimulating a desire for knowledge, in the case of boys in the way of the work of the farm, and the why and wherefore of everything done, and in the case of girls a good understanding of all the duties appertaining to a woman's life. Then, again, encourage and take part in some indoor games as well as outdoor sports, as the young need relaxation from the heavier duties of life. In fact, it should be the object of the parent to establish in the children a love of home, and a feeling that they are doing good useful work.

Parkesbourne.

At the September meeting of the above branch, Mr. H. Friend read a paper from which the following is extracted:—

Sheep Raising.

The most profitable sheep for the good pastures and the cultivation land are the cross-breds, as they produce good wool and a valuable carcase. They are not suitable for sour country. The most suitable cross for the Goulburn district is the Lincoln-Merino. This cross is a good wool producer and the ewe makes a splendid dam for lamb-raising. To produce lambs from this cross, it is advisable to mate with a Shropshire ram. The Shropshire is a quick grower, and this being a late district this cross enables us to make up for it by having the lambs ready for market much earlier than could be done in any other way. Of course, the Shropshire-Lincoln-Merino cross is comparatively of no value for wool production. They should be kept fat from the time they are born until they are marketed, and should not have any check whatever. When they are about six months old they should be passed on, as at this age they are very plump, and will command almost as high a price as two-tooth wethers when fat, up to 16s. often being obtained for them.

In selecting a ram for lamb-raising you should ensure as far as possible that the ram is true to type, and that he has a good constitution. What is meant by trueness to type is that the sheep is fully developed and well proportioned, according to what breed it is. All sheep are not the one shape, a Lincoln being a very square, deep-bodied sheep, whereas a Shropshire or a Border-Leicester have larger forequarters than hindquarters.

As everybody knows, it is absolutely essential that a sheep should have a good constitution, especially the sire of the flock, for if the sire is a weak constitutioned animal the progeny is sure to be the same.

Five of the chief characteristics of a good constitutioned sheep are as follows:—(1) Good, broad, robust chest; (2) The skin should have a good sound colour, generally pinkish; (3) Head held in proper position—if a cross-bred straight, if a Merino held well up; (4) When standing the front legs should not be too close together, as a sheep that stands thus has not sufficient room for its internal organs to work properly; (5) The head should be a good shape, the forehead broad, lips not too thick; in a Merino ram, the horn

should be nicely arched, and well corrugated, and in a cross-bred the ears should stand well out but never down, for a sheep with its ears down can be depended on to have something the matter with it.

A good plan to keep sheep in a sound, healthy condition is to dip them. It is not much trouble but it exterminates all vermin (ticks, &c.), and it greatly benefits the wool.

Ponto.

A new branch has been established at Ponto, with Mr. J. Jackson as Chairman; Mr. C. B. Douglas, Vice-Chairman; and Mr. A. D. Dunkley, Hon. Secretary and Treasurer. The next meeting will be held about the 12th January, at which members have been invited to read their harvest reports.

Redbank.

Mr. A. J. Pinn, Inspector of Agriculture, delivered a lecture on the 22nd September to members of the above branch, Mr. Day presiding.

Potato Growing.

Mr. Pinn stated that the district was eminently suited for this crop, but was suffering on the Sydney market through the carelessness of farmers in forwarding their produce in a dirty state, and in second-hand bags. It would pay better to grade and forward in new sacks.

The ground should be fallowed as early as possible, and a system of green manuring followed, also a rotation of crops such as potatoes, oats, or wheat, and field peas.

Great care should be taken in picking the seed, and only those tubers showing strong healthy shoots retained. It was not a good plan to pit seed, as this destroys to a great extent the vitality. Seed should not be planted a greater depth than 5 inches. It always paid to use the cultivator, and a light hilling was an advantage.

Mr. Pinn illustrated his lecture with lantern views, also showing the latest machines used in planting and harvesting the crop.

Mr. Stan Cullen, in proposing a vote of thanks to Mr. Pinn, stated at the same time that he hoped members would follow the advice and go in for a more thorough mode of cultivation.

St. John's Park.

Mr. Hadlington, Poultry Expert, gave a lecture and demonstration on poultry on the 25th October last.

Poultry Systems.

Being questioned on poultry "systems," Mr. Hadlington remarked that while poultry equipment must, as in other lines, be regarded as progressive, he could not but regard some systems as in the experimental stage, and advised his hearers not to go in for too much experimentation and neglect the main factors, but to concentrate their efforts upon raising more stock. The great need, so far as he could see in his travels around the farms, was not so much "systems" to put hens in, as hens to put in the "systems." There certainly was not sufficient stock being raised, and many poultrymen this year would not raise sufficient to cover their outgoing old hens. They should spend their efforts more on hatching and rearing equipment, for the pullets would pay anyway.

He also emphasised the fact that the Department was establishing a complete poultry plant at the Hawkesbury Agricultural College, where any new idea that was considered feasible would be tested and reported upon. This information would be made public as it became available, and it would be well for those with small means to await the results.

A lecture on "Conformation and Unsoundness in Horses," given by Mr. A. E. Massy, M.R.C.V.S., on Thursday, 6th November, was attended by a fair number, and a good deal of interest was shown.

Toronto.

The annual meeting of this branch was held on the 1st November. The membership for the past year was 31. The hon. secretary stated that very

useful information had been received from the Department of Agriculture by means of publications supplied to orchardists and bee and poultry farmers. The demonstrations and lectures given by the Fruit Expert and Demonstrator in Apiculture had been well attended by the members and others interested.

The following gentlemen were elected office-bearers for the ensuing year:—Chairman, Mr. J. Burten; Vice-Chairman, Mr. A. Flintoff; Treasurer, Mr. J. Cockburn; and Hon. Secretary, Mr. J. G. Desreaux.

A demonstration on comb foundation making was given by Mr. R. G. Warry, Demonstrator in Apiculture, to the members of the branch on Wednesday, 12th November.

MAKING COMB FOUNDATION.

Melted beeswax was poured into the dipping tank, and a pile of wax sheets was produced by using a wet dipping board. It was shown how the right temperature of the wax in the dipping tank would produce an even sheet, and how too high a temperature produced a thin uneven sheet, whilst too low a temperature would produce a thick uneven sheet. After several sheets had been dipped in this way, they were tempered in warm brine and passed through the foundation mill.

The use of plenty of soap lather on the rolls of the mill was shown to prevent the wax sheets sticking to the rolls. It was pointed out that the rollers of the mill must be set parallel to each other. This was demonstrated by setting the rolls closer together at one end than the other, then rolling a few sheets. These sheets were produced curved, and the impression of the cells in the sheets was uneven. The error in the setting of the rolls was then corrected, and a number of good sheets of foundation were produced. About 15 pounds weight of foundation was made.

Wallendbeen.

Mr. H. C. Stening, Inspector of Agriculture, delivered a lecture on the 17th October, to about fifty members of this branch.

WHEAT CULTURE.

The first portion of the lecture was devoted to the explanation of how large quantities of moisture may be stored and conserved in the soil by fallowing, and of the many other advantages that are to be derived by the practice.

With the aid of lantern pictures methods of cultivation were explained, also the treatment of seed-wheat for the prevention of bunt, grading seed-wheat, manuring, and the necessity of maintaining the supply of humus in the soil. The practice of sowing very late was deprecated. Views of the different varieties of wheat recommended were thrown on the screen, and their characteristics and habits of growth of each were described.

The following are some of the questions put to the lecturer at the conclusion of the lecture:—

Question.—What do you consider the best method for pickling wheat with bluestone and lime?

Answer.—The wheat should be divided into butts, each containing about a bushel, and immersed in the bluestone solution, which should be prepared by dissolving 1½ lb. of bluestone in 10 gallons of water, thus making a 1½ per cent. solution. During immersion, the grain should be vigorously agitated, so as to allow the solution to reach every part of every grain. This agitation dislodged air bubbles that became entangled in the hair constituting the brush of the grain, which prevent the fungicide coming into contact with the spores at this point, where they are usually attached. The mouths of the butts should be left open, so that unbroken bunt-balls which float on the solution may be skimmed off, for the fungicide has no effect upon these, and if not removed they will probably become broken later, and reinfect the grain. After thorough draining, that is, when the solution ceases to drip, the wheat should be immersed in a 1 per cent. solution of lime for a few seconds, and then allowed to dry sufficiently to pass through the drill uninjured.

Question.—Will a single smut spore cause smut?

Answer.—Yes. A single bunt spore attached to a grain of wheat is capable of infecting a wheat plant with bunt, and there are millions of these microscopic spores in one bunt-ball. This emphasises the necessity for care in pickling so that the fungicide may be brought into contact with every spore.

Question.—Why is it that smut rarely occurs in a self sown crop?

Answer.—The explanation given for this is that the dews and rains that fall on the infected grain, exposed on the surface of the soil, cause the bunt-spores attached to the grain to germinate, but are insufficient to effect the germination of the grain itself. The fungus, therefore, dies of starvation, as it requires a wheat plant to live upon.

Question.—Do you consider one harrowing and two cultivations with the spring-tooth cultivator a sufficient number of times to work a fallow?

Answer.—No rule can be laid down for the number of times a fallow should be cultivated. It will depend upon the weather. One season two or three cultivations may suffice, while another season half a dozen cultivations would not be enough. It is not the number of times that should be considered, but the *right* time to cultivate. Cultivation is necessary after every heavy rain which compacts the surface soil; for compacted surfaces denote that the soil has "sprung a leak," and in order to prevent loss of moisture, the soil-mulch must be renewed.

Question.—Can harm be done by cultivating a fallow at any time at all?

Answer.—There is nothing to be gained by cultivating the fallow, unless it is for the purpose of maintaining a loose surface soil, or for the destruction of weeds. Unnecessary cultivation not only increases the cost of production of the crop, but it will probably be a detriment by rendering the surface soil too fine, in which condition rain readily causes it to run together and set hard.

A cordial vote of thanks to the lecturer was carried.

Uralla.

Mr. H. C. Coggins, Assistant Inspector of Agriculture, will give a demonstration of clearing and subsoiling with explosives on Wednesday, 10th December.

Wollun.

Mr. C. H. Marsh dealt with the question of the blow-fly pest, at the meeting held on the 25th October.

The Blow-fly Pest.

The pastoralist is largely to blame for the pest, inasmuch as he has allowed it to breed on his property during the past fifteen to twenty years. I have seen heaps of dead rabbits which had been slaughtered for their skins alone literally heaving with maggots. I have also seen the same thing around tanks where rabbits have been poisoned with water, and where no attempt has been made to destroy them. Flies will not only breed on dead carcases and offal, but in swampy ground in warm climates. The only way to get rid of the pest is to destroy its primary breeding ground, viz., dead carcases and carrion of all sorts. If this were done in a systematic manner by *all* pastoralists, I venture to say that in about ten years' time the pest would be reduced to a mere detail. No doubt this would be a very tough problem on large holdings, but so is the fly.

It is a great mistake to burn carcases when they are fresh. They should be placed on some wood and allowed to get thoroughly blown before burning. In this manner not only will the flies be destroyed, but also thousands of future ones. In my opinion all dead wool and wool that is shorn off maggoty sheep should be burned at once to destroy the maggots in it. This would mean a small loss to pastoralists, but the game is worth the candle.

I have seen some people using patent fly-traps, but in my opinion the best trap is a dead carcase on a heap of wood ready to burn when thoroughly blown. There are a great many so-called preventives and remedies for the pest, but so far I have found none really effective. Therefore it behoves all pastoralists to do their utmost to get at the breeding grounds of the fly and destroy it there.

Discussion.—Mr. H. H. Burnell suggested that carcases be poisoned with arsenic to destroy the fly.

Mr. C. E. Burke gave the following method of prevention which he had seen successfully tried in the north-west. Crutching should be done a fortnight before lambing, the wool being cleared away well up from the thighs and a couple of inches above the tail. A man or boy with an earthenware bucket or jar and a mop is required to every four crutchers on the board, and every sheep crutched is treated with a bluestone solution on all crutched parts. A 30 or 40-gallon cask is filled with water, and 20 lb. of bluestone

in a chaff-bag is allowed to hang in the water over night. When the water is a nice deep blue colour, it is considered strong enough, and the 30 gallons is sufficient for 1,000 sheep. Earthenware or wooden vessels must be used, and not metal ones. The bluish colour given to the wool wears off by shearing time, and the treatment does not affect the prize of the wool. It is considered that the crutching should be done on a daily wage, as otherwise the boys are not given sufficient time to complete the treatment.

Wolseley Park.

The Sheep and Wool Expert (Mr. J. W. Mathews) conducted several demonstrations at Wolseley Park recently.

He spent two days in the district, and visited four sheep farms, thereby enabling a number of farmers to witness the demonstrations without travelling long distances. A lantern lecture was also given by Mr. Mathews at the local Mechanics' Institute, and well attended.

Sheep for Profit.

Speaking at the demonstration, Mr. Mathews stated at the outset that the farmer would require to consider what class of sheep would be most profitable for his district. Generally speaking the large holder would do better with the Merino, and the small holder with cross-breds. The difference in soils and climate would also have to be reckoned with, as poor soils produced light sheep and fleeces, while large sheep producing heavy fleeces required good soils. If the land is wet and swampy or sour, the Romney Marsh would doubtless prove better than other breeds, but they should be kept pure. There were two markets to be taken into consideration, (*a*) the wool and mutton market, and (*b*) the fat lamb market. The latter was out of the question in the district in question, owing to the great distance from market and want of railway communication, but he had great faith in the district for cross-bred sheep, mentioning that as a rule cross-breds did well in country that was suitable for agriculture, and where the soils were rich and could be profitably cultivated. The value of the fleece was the most important factor in this district, but at the same time a profitable mutton sheep was required, in order to obtain a satisfactory price when selling off the sheep. Merino ewes to mate with Lincoln rams should be large and roomy and plain-bodied. He did not favour the use of young ewes for cross-breeding, nor did he consider that the progeny of Lincolns should be marketed as lambs, but two clips of wool should be taken off, and the sheep then marketed at two years old. First cross ewes should be mated with unrelated Lincoln rams, so as to guard against inbreeding. On the second cross ewes a Merino ram should be used, on the third cross Merino again, and then back to Lincoln. This he thought would be the most profitable combination in the localities suitable to the cross-breds.

Questioned on diseases, Mr. Mathews said that in most of the wetter districts, sheep were liable to disease, the most common of which were fluke and worms. Fluke could be detected by a yellowishness about the eye, tongue, roof of mouth, also by the emaciated condition of the animal; and worms by the pallidness of the skin and the failure of the animal to respond to better feed. On all farms, he advocated the liberal distribution of salt, served in a weather protected trough, and made up in the form of a lick, consisting of the following ingredients:—Liverpool salt, 40 parts; sulphate of iron, 1 part; calcium phosphate, 5 parts.

Where drenching is necessary the sheep should be drenched three times in a year, viz., March, April, and May. A good drench is 1 oz. arsenic, 2 oz. common washing soda, and half a gallon of water. Mix and boil the whole slowly for half an hour, then add one and a half gallons of water and let stand to cool. When cool pour off the water, removing the sediment, which should be destroyed. Dose,—for weaners, ½ fluid ounce; for older sheep, 1½ oz.

The sheep should be yarded overnight, and starved for about fifteen hours before drenching, the drench being administered early in the morning, and the sheep then allowed to stand for about three hours. A proper drenching horn should be used The sheep should be drenched while standing, the head being raised.

On each occasion Mr. Mathews was thanked heartily by the members.

Orchard Notes.

W. J. ALLEN.

DECEMBER.

THIS is a busy month for the orchardist, and it will be difficult to find the necessary time for the various operations which call for attention. "First things first" must be the motto, and the man who can marshal at the close of the day the duties of the morrow, and outline his plans accordingly, will ensure a satisfactory return at the end of the season. It is not everyone who can review the past and foresee the immediate future in this way, and two things will assist in the direction desired. A diary of the previous season's operations may suggest many things that might possibly slip the memory, and a "reminder" note-book, however rough, in which may be pencilled down at odd intervals, the things that *must* be done, cases to be ordered, harness to be repaired, agents to be advised, &c., will make the lot of the orchardist a little less hard at this time.

Cultivation.

This cannot be neglected without increased labour in the future, as a few days' inattention may mean a coating of summer grass and couch which will take many days to eradicate.

Pests.

Codlin moth must be kept in check in accordance with the regulations as published previously in these Notes.

Fruit-fly is fortunately somewhat difficult to find just now, but growers should not neglect to keep an eye open for its recurrence. If it makes its appearance, the use of kerosene traps set round the trees or hung from the branches is recommended. These traps are tins about 5 or 6 inches square and 2 inches deep (large sardine tins will do excellently), with half an inch of kerosene in the bottom.

Thrips has done considerable damage in some of our fruit districts, but it is almost too late to remedy the evil now, let alone prevent it. The growers who have used the quicklime solution recommended in the December issue of last year, have kept the pest in check, and lime-sulphur applied early has proved a great deterrent. Investigations are being carried out by the Department in connection with the use of various sprays, and the results will be published in due course.

Scale on citrus trees may be treated this month by either spraying or fumigation, but it is better done before the trees bloom and again as soon as the fruit has set.

Vegetable growers have not found the pumpkin-leaf beetle so prevalent this year as last, but it is advisable to keep a good look-out for the trouble. The method suggested by the Orchardist at the Hawkesbury Agricultural College, recommending the use of a quarter of an ounce of Paris green mixed with a pound of slaked lime, applied in a bag of doubled cheese cloth, and shaken over the plants, has been found very effective.

Irrigation.

Where the application of water is possible, the soil should receive a good soaking this month, and the ground cultivated thoroughly afterwards. When the water can be turned on either early in the morning or late in the evening so much the better, as the loss by evaporation will be considerably lessened.

AGRICULTURAL SOCIETIES' SHOWS.

SECRETARIES are invited to forward for insertion in this page dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Sydney, not later than the 21st of the month previous to issue. Alteration of dates should be notified at once.

1914.

Society.	Secretary.	Date.
Albion Park A., H., and I. Association	M. A. Brown	Jan. 14, 15
Gosford and Brisbane Water A. and H. Association	R. J. Baker	,, 23, 24
Kiama A. Association	G. A. Somerville	,, 23, 24, 26
Wollongong, A., H., and I. Association	W. J. Cochrane	,, 29, 30, 31
Berry Agricultural Association	S. G. Banfield	Feb. 4, 5
Dorrigo A., H., and I. Society	W. R. Colwell	,, 10, 11
Moruya A. and P. Society	H. P. Jeffery	,, 11, 12
Alstonville Agricultural Society	C. D. McIntyre	,, 11, 12
Wyong A. Association	J. H. Kay	,, 12, 13, 14
Guyra P., A., and H. Society	P. N. Stevenson	,, 17, 18, 19
Gunning P., H., and I. Society	J. R. Turner	,, 18, 19
Newcastle A., H., and I. Association	E. J. Dann	,, 18, 19, 20, 21
Central Cumberland A. and H. Association	H. A. Best	,, 20, 21
Dapto A. and H. Society	J. H. Lindsay	,, 24, 25
Manning River A. and H. Association	S. Whitbread	,, 25, 26
Inverell P. and A. Association	J. McIlveen	,, 25, 26, 27
Bowraville A. Association	C. S. Cliff	,, 26, 27
Uralla A. Association	H. W. Vincent	Mar. 3, 4, 5
Tenterfield P., A., and M. Society	F. W. Hoskin	,, 3, 4, 5
Tumut A. and P. Association	T. E. Wilkinson	,, 4, 5
Braidwood P., A., and H. Association	L. Chapman	,, 4, 5
Bega A., P., and H. Society	W. A. Zingel	,, 4, 5
Port Macquarie & Hastings Dist. A. and H. Society	T. Dick	,, 5, 6
Oberon A., H., and P. Association	M. J. Looby	,, 5, 6
Central New England P. & A. Association (Glen Innes)	George A. Priest	,, 10, 11, 12

AGRICULTURAL SOCIETIES' SHOWS—*continued.*

1914.

Society.	Secretary.	Date.
Molong P. and A. Association	W. J. Windred ...	Mar. 11
Coramba District P., A., and H. Society	H. E. Hindmarsh	,, 11, 12
Bombala Exhibition Society	W. G. Tweedie ...	,, 11, 12
Campbelltown A. Society	F. Sheather ...	,, 11, 12
Gulgong A. and P. Association	D. H. Spring ...	,, 11, 12
Tumbarumba and Upper Murray P. and A. Society...	E. W. Figures ...	,, 11, 12, 13
Wauchope P. A. and H. Society	A. D. Suters ...	,, 12, 13
Gundagai P. and A. Society	A. Elworthy ...	,, 17, 18
Bangalow A. and I. Society	W. H. Reading ...	,, 17, 18, 19
Armidale and New England P., A., and H. Assoc'n.	A. McArthur ...	,, 17, 18, 19, 20
Cumnock P., A., and H. Association	K. J. Abernethy...	,, 18
Cobargo A., P., and H. Society	T. Kennelly ...	,, 18, 19
Camden A., H., and I. Society	C. A. Thompson...	,, 18, 19, 20
Goulburn A., P., and H. Society	G. G. Harris ...	,, 19, 20, 21
Mudgee A., P., H., and I. Association	P. J. Griffin ...	,, 24, 25, 26
Narrabri P., A., and H. Society	D. J. Bridge ...	,, 24, 25, 26
Blayney A. and P. Association...	H. R. Woolley ...	,, 25, 26
Macleay A., H., and I. Association	E. Weeks... ...	,, 25, 26, 27
Crookwell A., H., and P. Society	J. H. Huxley ...	,, 26, 27
Luddenham A. and H. Society	F. C. Emery ...	,, 31, Apr. 1
Cooma P. and H. Association	C. J. Walmsley ...	April 1, 2
Coonabarabran P. and A. Association...	G. B. McEwen ...	,, 1, 2
Upper Hunter P. and A. Association, Muswellbrook	R. C. Sawkins ...	,, 1, 2, 3
Royal Agricultural Society (Sydney)	H. M. Somer ...	,, 7-15
Adaminaby P. and A. Association	W. Delany ...	,, 15, 16
Scone A. Society	R. Lochhead ...	,, 21, 22
Batlow A. Society	C. S. Gregory ...	,, 21, 22
Kyogle P., A., and H. Society	R. J. Nithery ...	,, 22, 23
Bathurst A., H., and P. Association	J. Bain	,, 22, 23, 24
Hunter River A. and H. Association (West Maitland)	E. H. Fountain ...	,, 22, 23, 24, 25
Tamworth P. and A. Association	J. R. Wood ...	,, 28, 29, 30
Richmond River A., H., and P. Society (Casino) ...	D. S. Rayner ...	,, 29, 30
Gloucester A., H., and P. Association	S. J. Bignell ...	,, 29, 30
Orange A. and P. Association	W. J. I. Nancarrow	,, 29, 30 May 1
Northern Agricultural Association (Singleton) ...	E. J. Dann ...	,, 29, 30, May 1
Clarence P. and A. Society (Grafton)	G. N. Small ...	May 6, 7, 8
Hawkesbury District A. Association (Windsor) ...	H. S. Johnston ..	,, 7, 8, 9
Lower Clarence A. Society (Maclean)	J. McPherson ...	,, 12, 13
Warialda P. and A. Association	C. J. Devine ...	,, 12, 13, 14
N.S.W. Sheepbreeders' Association (Sydney) ...	H. N. Bowden ...	July 1, 2, 3, 4
Murrumbidgee P. and A. Association (Wagga Wagga)	A. F. D. White ...	Aug. 25, 26, 27
Cootamundra A., P., H., and I. Association	T. Williams ...	Sept. 15, 16
Yass P. and A. Association	W. Thomson ...	,, 30, Oct. 1

Government Stud Bulls available for service at State Farms, or for lease.

Breed.	Name of Bull.	Sire.	Dam.	Stationed at—	Engaged up till
Shorthorn ...	Imperialist ...	Florio	Lady Nancy of Minembah.	Wollongbar Farm	*
Jersey ...	Grenadin (imp.)	Attorney (9477)	Cyril's Carnation (imp.).	Wagga Farm ...	*
,, ..	Thessalian II. ...	Thessalian (imp.).	Egyptian Princess (imp.).	,, ,,	*
,, ...	Royal Blood ...	Berry Melbourne	Calceolus ...	Wollongbar Farm	*
,, ...	Xmas Fox (imp.)	Silver Fox ...	Malvoisie ...	Berry Farm ...	*
,, ...	Kaid of Khartoum	Sir Jack ...	Egyptian Belle	Wagga Farm ...	*
Guernsey ...	The King's Mirror	Calm Prince ...	Vivid (imp.)...	Kyogle	30 June, '14.
,, ...	Star Prince ...	Calm Prince ...	Vivid (imp.)...	,, ...	5 Mar., '14.
,, ...	Sky Pilot ...	Prince Souvia ...	Parson's Red Rose (imp.).	Maclean	11 Jan., '14.
,, ...	Prince Souvia ...	Vivid's Prince...	Souvenir(imp.)	Grafton ...	*
,, ...	Sequel's Lad (imp.).	Sequel's Monogram.	Moss Rose of the Barras.	Wollongbar Farm	*
,, ...	Godolphin Moses (imp.)	Golden Hero of the Vauxbelets (1929)	Rosetta (6509)	Inverell	5 April, '14.
,, ...	Sunshine ...	King of the Roses	Princess Vivid	Grafton	15 Jan., '14.
,, ...	Hayes' Fido (imp.).	Hayes' Coronation 3rd.	Hayes' Fi-Fi 2nd.	Wollongbar Farm	*
,, ...	Claudius (imp.)	Golden Star II..	Claudia's Pride(imp.).	Tweed River ...	18 Feb., '14.
,, ...	Trengwainton VillageFavourite (imp.)	Trengwainton Village Lad.	Wild Eyes ...	Berry Farm ...	*
,, ...	The Peacemaker	Calm Prince ...	Rose Petersen	Jones Island ...	31 Dec., '13.
,, ...	King of the Roses	Hayes' King ...	Rosey 8th (im.)	Bega	20 June, '14.
,, ...	Lauderlad ...	Laura's Boy ...	Souvenir of Wollongbar	Kyogle	3 Mar., '14.
,, ...	Royal Preel ...	Itchen Royal ...	Hayes' Lily du Preel(imp.).	Murwillumbah ...	9 May, '14.
,, ...	Prince of Warren Wood (imp.).	Kingsmoor Governor (1952)	Quail (7051)	Macleay River ...	8 Mar., '14.
,, ...	Alexander the Great.	Claudius (imp.)	Alexandrina of Richmond.	Frederickton ...	20 Mar., '14.
, ...	Rosehill (imp.)..	Northesk (2073)	Faultless Footsteps (6132)	Scone	19 June, '14.
,, ...	Duke of Orleans	Godolphin Arthur (1664)	Flower of the Preel 3rd (imp.)	H.A. College, Richmond	*
Ayrshire ...	Jamie's Heir ...	Jamie of Oakbank	Miss Prim ...	Grafton Farm ...	*
,, ...	Dan of the Roses	Daniel of Auchenbrain (imp.).	Ripple Rose...	Grafton Farm ...	*
,, ...	Orphan Boy ...	Songster of Greystanes.	Rosamond ...	Glen Innes Farm..	*
,, ...	Wyllieland Bright Lad (imp.)	Wyllieland Gleniffer (7229)	Wyllieland Sangie	H.A. College, Richmond	*
Kerry... ...	Kildare II ...	Kildare (imp.)...	Belvedere Bratha 3rd (imp.).	,, ,,	*
,, ...	Bratha's Boy ...	Aicme Chin(imp.)	Bratha 4th ...	,, ,,	*
,, ...	Rising Sun ...	Bratha's Boy ...	Dawn ...	Bathurst Farm ...	*

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